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Original Communications

PORCELAIN JACKET CROWNS*

By HUGH AVARY, D.D.S., San Francisco, California

THE aim of the ceramic worker, like that of the artist, should be to discern and represent nature's effects, for unless he can observe truly the forms, light, shade and color of natural objects, he cannot expect to achieve rational creations or to rise above mere artificiality. Ideas, whether concrete or abstract, must be based upon objects found in nature. As a famous painter has said, "It takes a master to truly represent Nature." The artistic temperament necessary to ideal work is very rare. There is no easy road for the student who would become an artist. Each must win whatever success he can attain at the cost of repeated failures and much hard work. The adoption of a concise technic, however, will help one to avoid many failures.

*Read before the Section on Partial Denture Prosthesis at the Seventh International Dental Congress, Philadelphia, Pa., Aug. 26, 1926.

LIGHT AND CARE OF THE EYES

Good light—eastern or northern exposure—with no buildings or other objects to reflect light into windows of the operating room is a primary essential. After experimenting with a number of different colors on the walls of the operating room, I have found that a pale neutral gray is the best. It will influence the color of the patient's teeth less than any other. Apropos of this, it is interesting that Ridgway, in his work on color standards and color nomenclature, has employed a neutral gray background for mounting 1,115 named colors. It is likewise the custom to hang paintings against neutral backgrounds.

Although not generally appreciated by the dental profession, several conditions may seriously impair the operator's color perception. It has been proved that the eyes of some individuals are seriously affected by the use of to-

bacco. In many cases, a marked improvement will be noted as a result of only forty-eight hours abstinence. Focal infection in the mouth may also impair the sight. A number of years ago, the Pennsylvania Railroad, to protect the traveling public, made tests for color blindness among the employes who were required to operate trains in conformity with signals by red and green lights. More than four per cent were found to be color blind. It would be a good idea for the dental colleges to give students tests for color blindness and, where possible, take measures to improve color perception. Dentists now practicing that are interested in the esthetic side of dentistry, and are attempting to match colors, would do well to check up on their own color perception. It is very necessary to ascertain whether smoking or caffein poisoning are injurious to the individual.

At the Annual Session of the National Dental Association, in Boston, in 1920, I presented a standardized technic for the preparation of teeth for porcelain jacket crowns. Teeth were grouped in four catagories, according to their alinement, as follows: (1) teeth in normal alinement; (2) teeth that are rotated; (3) teeth that are either labial or lingual to normal; (4) teeth where it is advisable to open the bite.

ROENTGENOGRAMS OF ENTIRE MOUTH AND STUDY MODELS

Roentgenograms should be made of the entire mouth to ascertain the position of the horns of the pulps, the length of the roots and the condition of the paradental tissues. The teeth should also be tested for vitality, for which purpose the Cameron pulp tester is very useful. An accurate impression of the tooth is then prepared, including several teeth on either side; and from this, a study model is made. The contour and characteristics of the patient's teeth as regards size, color and alinement should be noted. If the tooth to be jacketed is not in Class 1, that is, if it is not in normal alinement, we should determine about how much it may be corrected by jacketing, note which class it belongs to and make the preparation accordingly. The alinement of the finished jacket is largely determined by the way in which the labial surface of the tooth is prepared. For instance, if the tooth is in Class 2 or 3, and is still labial to normal after the preparation is finished, it will be impossible to have the jacket in proper alinement when completed. The guiding factor in the alinement of the finished jacket is the correct preparation of the tooth.

GENERAL IDEA OF PREPARATION

In a general way, the prepared tooth should resemble a small reproduction having the characteristic outline of the tooth itself. A correctly prepared cuspid should have the outlines of a cuspid and not of a central incisor, as is so often the case. A lower bicuspid should have the outline of a lower bicuspid with the buccal cusp more prominent, and not that of an upper bicuspid. If it is incorrectly prepared, and the buccal cusp is cut too short, there is danger of approaching too close to the horns of the pulp, or of traversing the recessional lines.

Again, a preparation in which the shoulder is over 1 mm. or less than 0.5 mm. is not correct. Unless necessary, as in an extremely small lower incisor or a rudimentary lateral incisor, less than 0.5 mm. should be regarded as insufficient for strength. Nevertheless, I have never found a case in which it was not possible to prepare a definite

shoulder, however small. If the finished jacket is as thin as paper, the cement will show through when the jacket is set. If the cuspid is prepared on the incisal edge as for a central incisor, the cement will also show through the porcelain.

TECHNIC

Class 1. Shorten tooth from 1 to 2 mm., according to the length of the tooth and the bite, with a large wheel stone. Next, cut away the approximate surfaces, starting on the incisal edge about 1 mm. from the angle, so that when they are cut down to the gingivae, shoulders are produced. In other words, start the cut about 1 mm. in toward the central axis, so that the shoulder is always ahead of the stone. This should be done with thin Miller separating disks. Next, cut grooves through the enamel on the labial surface with the same thin stone, first longitudinally, to about the depth predetermined from the study model. Cut the mesiodistal grooves, beginning at the gingival margin and to about same depth (not over 1 mm. as a rule). The surface will now be divided into small enamel blocks, which may be chiseled off. I prefer to grind them with an inverted cone stone. Cut into the tooth at the gingivae, to the desired depth, starting at the shoulder, drawing the stone toward the incisal edge. The labial shoulder should be carried under the gingivae with end-cutting burs and Miller stones No. 340½ in a right angle or contra-angle hand-piece. The labial incisal edge is ground until there is room for the porcelain to cover it. The surface is now trued up with the finishing burs and Miller stones No. 225, 231, and 268, using rapid cutting abrasive paste. This surface should be slightly convex.

The lingual is the last to be prepared. Note the bite and the characteristics of the development lines, grooves, etc., of this surface. With an inverted cone stone, cut through the enamel just short of the gingivae, then draw the stone across from the mesial to the distal edge, grinding through the enamel. Cut the shoulder under the gingiva, using end-cutting burs and No. 340½ Miller stones as on the labial edge. The shoulder should then be carried all around the tooth. Next, cut away any sharp angles at the mesial and distal edges of the tooth, and true up the shoulder so that it is uniform, not less than 0.5 nor more than 1 mm. The tooth may now be polished with cuttlefish disks and the shoulder planed with Black cutting instruments No. 53 or 54. The preparation is then carefully washed off, dried with alcohol and painted with resin chloroform varnish, which should be dried with the hot-air syringe. This is important, as it prevents the dentin from absorbing secretions, etc., lessens the thermal shock and prevents irritation of the pulp by any acids that may be liberated by the cement. The tooth is carefully covered with a guttapercha jacket made on the tooth, using a temporary filling. The color is now carefully analyzed, all markings and defects being noted on a chart. The patient is dismissed until the next day. The sooner the jacket is finished, the less the danger to the pulp from careless protection during the making of the jacket.

Class 2. The preparation is the same as for Class 1 as to the incisal edge and approximate sides. The labial is cut away more on the angle that is too prominent labially and very little from the other angle. By using care, it is often possible to cut off enough to correct the rotation to a marked degree, if not entirely. During the cutting of the prominent angle, grind slowly, use pledgets and dry the tooth at frequent intervals. Before we expose the horn of the pulp, we may observe a slight pink tinge. The limit of cutting has been reached. In these rotated cases, the shoulder is sometimes necessarily thinner on the less prominent angles, but that does not matter in these types, as the bite is lessened on the angle. The lingual edge is reduced the same as the labial. The shoulder is then finished in the same manner as for Class 1.

Class 3. Protruding teeth. The approximal and incisal surfaces are prepared as for Class 1, and the labial surface is prepared as indicated, care being taken to cut off as much as possible, on the incisal surface. In adults, more can safely be cut away and the protrusion corrected to a greater extent than in young patients. Very little should be cut at the linguo-incisal angle, and the shoulder on the lingual should be cut deeper under the gingivae than in Class 1. Where teeth are lingual to normal and adjacent teeth are not crowded, the labial shoulder is cut thin, about 0.5 mm., and extended farther under the gingiva. By gradually building out the con-

vex surface at the gingiva, the finished jacket may be made to appear to be on a root having normal alinement. The linguo-incisal angle is cut away as much as possible and shortened more than in Class 1. This allows the cutting edge of the jacket to be correctly alined without being clumsy and bulky; which would be the result if no definite technic were used.

Class 4. I have had a number of cases in which there was marked abrasion, the teeth being almost devoid of enamel and having the appearance of excessive wear. The appearance of the patient usually suffers from the closed bite, through compression of the lips and deepened lines around the mouth. These cases usually have end-to-end bites, and the patient is hypersensitive to thermal changes and is sensitive to sweets and acids, as the juice of grape-fruit or oranges. Where the pulp has not been involved, the only practical thing is to open the bite of the anterior teeth and bicuspids with jacket crowns. The molars may be built up with three-quarter hoods or mesioclusodistal gold inlays. The molars should be built up first. This simplifies the construction of the bicuspids and anterior teeth. The incisors are prepared as in Class 1, except that, where possible, the incisal edge is cut so there is a slight depression or groove mesiodistally. This greatly reduces the stress as the inclined planes prevent all the strain from being at the shoulder. The shoulder is carried deeper under the gingivae to secure more frictional retention.

Summary: The labial surface should be slightly convex, the lingual concave, the approximal slightly tapered from gingivae to incisal edge. The shoulder should be cut at right angles to the long axes of the tooth and cut square-edged, not bevelled. In the posterior teeth, the outline of the enamel should be followed. Bicuspids should have depressions running mesiodistally, but not buccolingually, as has been advocated by some, for there will frequently be pulp trouble if grooves are cut in this way as the stress in mastication on posterior teeth is greater buccolingually than mesiodistally. The contact points will take care of any mesiodistal stress. The tooth form should be reproduced as accurately as possible. Nature designed the forms of teeth to discharge certain functions; namely, to be efficient masticating surfaces, and to protect the investing tissues. It cannot be too strongly emphasized that, unless the tooth form is correctly restored, the gum tissue may recede in a year or two. Poor tooth form allows the bolus of food to be forced against the gingivae, instead of deflecting it, as Nature intended. Contact points should be restored as indicated in each case.

It is not necessary to cut in even as deep as a small approximal filling usually extends. The more dentin left to protect the pulp, the better.

The tooth should be prepared, copper bands adapted to fit about 1 mm. beneath the gingivae and a modeling compound impression taken, which must show a clearly defined outline of the shoulder. The wax bite is taken; the teeth are washed with warm alcohol; resin-chloroform varnish is dried on the dentin; the guttapercha jacket is adjusted; the color is studied, and notations are made of any surface markings on the enamel. This should all be done in one sitting. The patient may then be dismissed until the next morning, with instructions to keep the guttapercha jacket on the tooth.

Then the operator or assistant should pack up an amalgam model of the prepared tooth, building the amalgam down to a tapered root form. Tapering the root form makes it easy to handle. If one side of the root is made flat (the labial, for example), it will prevent the model from being incorrectly seated in the plaster cast during the making of the jacket.

The study model and all roentgen-

ograms should be carefully studied before making the preparation; for the more clearly the picture of the finished preparation is held in mind, the better the technic will be carried out.

By using a Boley millimeter gage and carefully measuring the tooth in the mouth, as well as on the study model, a much better conception can be gained of the possibilities in the case. As no chain is stronger than its weakest link, no jacket crown will be ideal unless the technic for its correct preparation is carefully followed. Take all the time necessary to prepare the tooth as accurately as can be done. I use nerve blocking, with a 1.5 per cent procain-epinephrin solution in the majority of the preparations on vital teeth. The patient can then relax and the operator is able to proceed to better advantage. When the shoulder is planed during the final finishing, the patient will hold still and not flinch; also when the copper band filled with hot modeling compound is carried just beyond the shoulder, there will be no discomfort. Of course, in a few of the middle-aged, when the pulp has receded to quite an extent, it is possible to prepare the tooth without procain.

After the tooth is prepared, a copper band 15 mm. or one-half inch long, 36 gage, is selected from an assorted box of bands. These bands are very convenient to use as they increase slightly in diameter from the smallest, No. 1, to the largest, No. 20. It is a simple matter to anneal a band, festoon it to fit the gingivae and try it on. For example, No. 4 will fit the average central incisor. If it happens to be a little too small, No. 5 will fit nicely. The band is marked on the labial side to guide the operator in placing it on the root correctly.

Fill the band with modeling compound, softened in hot water. Have the compound extend at least 1 mm. beyond the band. Pass the end through a Bunsen flame. Then with the thumb and fore-finger, gently force the band over the tooth. The slight excess of soft modeling compound will have a tendency to shove the free gum margins away from the shoulder. With the large end of an instrument applied at the open end of the band, force the compound down until the shoulder is sharply defined. Then take a small plastic instrument and go around the band under the gingivae. Be sure that the band goes just beyond the shoulder. Chill the band thoroughly with ice water or cold water and remove. It is absolutely essential that the impression show a sharply defined shoulder, and an accurate imprint of the entire preparation. Now lay the band aside, and wrap around the tooth a piece of temporary filling that has been softened in flame; making a guttapercha jacket. Use a plastic instrument to adapt under the gingivae.

Take a sheet of wax and form into a soft roll. Place a small piece of No. 40 gage tin foil in the middle of the wax roll and have the patient bite into the wax. Chill and remove. Place the guttapercha jacket in the wax bite and lay it aside until the amalgam model is packed and ready to be inserted in the guttapercha jacket in this wax bite. Before casts are poured, the root should be flattened on the labial surface, tapered and oiled with a film of vaseline (petrolatum). This will enable it to be easily removed from plaster casts. The flat surface on the labial side of the tooth will prevent the model from being incorrectly seated in the plaster cast during the making of the jacket. Make another guttapercha jacket, for the patient to wear to keep the gingivae packed away from the shoulder.

Note the color of patient's teeth carefully. Study the surface markings of the enamel; also the type of tooth by observing the outline of the labial surface, if it is an anterior tooth. Dismiss the patient until next morning, with the warning to refrain from biting on the guttapercha jacket.

Wrap one thickness of wax around the copper band, and invest in plaster in a tapered metal ring that has been oiled. This supports the modeling compound impression and enables the amalgam model to be packed nicely. Build a tapered root of amalgam at least 1

inch long that will enable the operator to grasp it during the carving of porcelain. The platinum matrix is next wrapped around the amalgam root. Use one one-thousandth platinum foil, making a tinner's lock joint on the lingual surface. Foil must be well burnished on the amalgam root. Remove the matrix. Cut the skirt so that it extends at least 1 mm. beyond the shoulder. This is important, for if it is too short, it is difficult to reburnish the matrix after the biscuit bake. Take a small stone and cut through the extra thickness of platinum at the lock joint. Wrap a small wisp of cotton on a wooden toothpick, dip it in shellac and paint a thin coating on the shoulder. Then apply the underlying color of porcelain with a spatula. Use distilled water and mix to a thick consistency. The thicker the porcelain can be worked, the better. Cover the entire matrix and vibrate to drive out moisture. Quickly blot with a piece of clean gauze, then sprinkle on dry porcelain powder, and whip the porcelain with a large sable hairbrush. This will so thoroughly condense it that the shrinkage is reduced to a minimum. It is one of the simplest ways that a novice may learn to obtain density; and I believe is as dense as can be obtained in any practical method.

Then with a sharp lance, or spatula, cut away the porcelain until it barely covers the matrix at the incisal edge. Be sure no porcelain is slopped over the margin of the matrix beyond the shoulder. With a No. 4 sable brush, go carefully around the shoulder, brushing away all excess porcelain from below the shoulder. Place the matrix on a fire clay slide on which is sprinkled granular silex and imbed the matrix slightly. Place the slide in a cold furnace under the thermocouple in the muffle. Turn on the current, and run the furnace on the first button for five minutes. It will be about 1000 F. Then run it two minutes on the button until a biscuit bake is reached. Open the door of the furnace and quickly remove the slide, replacing the furnace door immediately. Place the slide under a glass on a piece of clean marble or asbestos. This will permit the porcelain to cool slowly and tempers it at the same time. It may be replaced on the amalgam root and reburnished in about five minutes. If the slide is left to cool in the furnace, it will be about thirty minutes before the jacket is cool enough to be worked on.

The adjacent plaster teeth on the cast are painted with varnish. This will prevent the plaster absorbing water from the porcelain when it is placed on the model and built up. The shoulder should be reburnished and porcelain packed into any places that need it. The enamel layer is now applied to the surface over the first layer.

This superimposition makes a gradual blend of color tones that will simulate the patient's own teeth. After contouring, ship the tooth again with a large sable brush, put on the slide and place in the furnace and fire. Remove, and try the jacket on the amalgam root. Check up the contour and color by trying it in the patient's mouth. Remove and place on the model to finish contouring. Again, carry to the furnace and fire, always keeping the porcelain 100 degrees under the glazing point, until the size and color are correct. If this precaution is followed, the tooth may be safely fired several times. A beginner should be able to reproduce the contour and color of the patient's tooth in, say, three bakes. Again try in the patient's mouth, noting contacts, points, contour and color. Remove and grind in any surface markings, using gem stones or Miller pyorrhea grinding points, or alpine stones, but not carborundum stones. Wash off with alcohol, dry and place in the furnace, and run up the heat until a glaze is effected.

When the porcelain is properly glazed, and has cooled, try it in the patient's mouth. If it should be necessary for any reason to add more porcelain either to build in the joint or make the contact points tighter, it is better to use porcelain that fuses from 100 degrees to 200 degrees lower than the fusing point of the jacket. It is never advisable to run up the heat until the porcelain reaches the glazing point, after it has once been glazed, as it will be overfused. If the jacket fits well at the shoulder, and the contour and color are all that could be desired, dip the jacket in a small dish of alcohol or water. With tweezers, grasp the platinum foil skirt and roll it away from the margins all the way around the shoulder. It may then be grasped with tweezers, and, by gently twisting and pulling, it is possible to remove the matrix in one piece.

Slip the guttapercha jacket off the patient's tooth, and syringe with warm water. Place cotton rolls to keep the tooth dry, also using the saliva ejector. Dip a pledget of cotton in alcohol, and pass through the Bunsen flame.

Put out the flame and quickly wipe off the preparation. Have cement, slab and spatula ready. "Ceramic" cement has been found very satisfactory. It is white and will influence the color of the porcelain jacket less than any other cement. I prefer it to silicate cement as it has greater adhesive qualities. It is best to fill the jacket brimful of cement, mixed to a thick, creamy consistency. Grasp the jacket in thumb and forefinger and gently ease it to place. If the preparation is correct, it will not be possible for the jacket to be seated, unless it is put on correctly. Keep the jacket dry until the cement has set. Keep the excess cement on the spatula on the cabinet, and test until it breaks clean. Then, with a small file, break away the excess cement from the shoulder. Pass the dental floss through the contact points and gently draw through spaces at the gingivae. Syringe the particles of cement away or use a spray. Carefully check up on the occlusion, using articulating paper. Polish the incisal edge of the jacket with paper disks, until it is the proper length. If each step in the technic is carefully and correctly performed, there will be no pulp trouble. Make a note on the patient's chart of the color blend used, for future references, together with surface markings, and file it away.

In a case in which it is advisable to make jackets on the four upper incisors, roentgenograms should be taken and accurate study models made, also labial impressions to study the labial surfaces carefully. It should be decided whether any changes are indicated in the alinement, and if so, to what extent improvement is possible. It is not practical for the majority of dentists to attempt to prepare all four incisors at once and bake them simultaneously. The harmony of proportion may easily be lost. It will be vastly more difficult than if one central incisor is first prepared and finished, and then the contacts are restored correctly, and the other central incisor is made. The two lateral incisors may be safely made at the same time as they fit the space between the central incisors and cuspids. Use a Boley millimeter gage and check up on the size of these jackets to be sure that they are correctly made. It is a fallacy to believe that to match several jackets exactly, they must be made at the same time. If a precise technic for laying on the colors is followed, they may be accurately reproduced at any time. Nature's color scheme should be studied carefully. Notice that the teeth blend from a light to a darker tone. The cuspids, for instance, are several tones darker than the central incisors. The lateral are slightly darker than the central. The bicuspids are lighter than the cuspids, with not so much orange color in them. Often, in making bicuspids, it will improve the esthetics to put a touch of blue or gray on the edge of the occlusal surface to stimulate the enamel effect where it is not influenced by the dentin.

I cannot too strongly criticize the men who advocate the shoulderless jacket crown. Nothing can possibly be gained, and there is no logical reason for making them. Some say it enables jackets to be placed on children's teeth broken in accidents. Jackets are rarely indicated in children under 15 years of age. Children under that age, in my experience, are seldom self-conscious, and I prefer having an orthodontist make a band to be cemented on the tooth. A dressing of carbo-eugenol is placed in the incisal end of the band and sealed against the dentin by flowing a hard cement over the carbo-eugenol. This will enable the pulp to recede gradually, and will be far better than to attempt to place a jacket too soon. Often from four to six weeks may elapse before any signs of pulp trouble from the shock of the break may occur. It is best to proceed slowly in such cases. When a small but definite

shoulder is cut on a given tooth, it is not cut deeper in toward the pulp than when all the enamel is removed for a so-called shoulderless preparation. It is also a question whether the thick feather-edge under the gingivae may not, in time, cause recession by creating a tension on the tissue of free gum margin. It is really impossible to remove every bit of enamel. Any short rods of enamel that may be left on the prepared tooth will remain indefinitely. By using a common sense technic and preparing each tooth according to the requirements of that particular case, always bearing in mind to keep as much dentin as possible over the horns of the pulp, we shall surely be rendering the best possible service, preserving the vitality of the teeth as well as taking esthetics into consideration.

"Be not the first by which the new are tried, nor yet the last to lay the old aside." Accept no new technic that has not stood the test of time.

A study of tooth form can be greatly aided by collecting types of extracted teeth, and mounting them in either wax or a plaster block, where they may be studied; also by making a study model of the mouth before attempting the restoration of the tooth with a jacket. We must learn to visualize the tooth minutely, and should chart peculiarities in the form or texture of the enamel on the labial or buccal surfaces of the adjacent teeth, noting the location of spots, defects, development grooves and imbrication lines and stains that are individual for that patient's teeth. When we study minutely the natural teeth, and only then, may we hope to give the patient the maximum benefits that he is entitled to and should receive. An artist does not attempt to reproduce a figure from memory. He uses a model. Much better work is done when we can visualize that which we wish to reproduce.

STUDY OF COLORS

Most of us are aware that red, yellow and blue are called primary colors or pigments because they form the basis of color mixing and cannot be made by mixtures of other pigments. In jacket-crown work, sometimes two or more colors are mixed and then used. Colors are often used by superimposition; for example, orange is employed for the underlying body, and over that a blue or gray enamel is laid. A wide variation of hues or color tones are possible. By mixing the three primary colors, a neutral gray can be made. It is well, at this time, to consider the effect of light and shade on color. To do this, take an orange and place it on a table so the light will fall on it from one direction. The side toward the light will appear lighter or brighter, while the side away from the light will appear darker or duller. It is really a difficult matter to decide the exact color of the shaded side of any object because so many factors are involved: (1) the natural color of the thing itself; (2) the texture of the surface of the object, whether smooth or rough, shiny or dull, etc.; (3) the intensity and color of the light falling on the object; (4) the depth or degree of the shade, which increases as the surface is more completely turned away from the light, and is further removed from other objects capable of reflecting light back to it, and (5) the quality and color of the light reflected into the shade from other objects. Bearing these facts in mind, let us consider the orange again. That small portion of the orange upon which the light falls directly, appears

quite light (this is termed the high light). The light side having a mixture of red and yellow for its local color will need the addition of blue for its shade, making it brownish.

As to the effect of light in modifying color, we should appreciate that the texture of the surface is an important factor, for the greater the amount of light reflected from the surface, the less the color of the surface can be seen.

This can be well observed by placing side by side two objects, as a common flower pot (with a dull brick red surface) and a similar jar of earthenware, glazed; or better still, a small pitcher of the same common earthenware partly glazed. It will be then observed that the glazed surface will show spots or streaks of bright, reflected light (images of the window) where the color of the surface is not seen at all. But the dull surface will show its brick-red color, although this will appear much paler where the light falls directly on it, because its rough surface reflects a certain amount of scattered white light.

In our color matching of the patient's teeth, it is well to stand several feet away to observe the color from different positions. The patient should stand so that we may note the color at a conversational distance, and should keep the teeth wet with saliva. Often by inclining the head so that our eyes are on a vertical plane, the color may seem different. Squinting the eyes also helps us to gain a better conception of the color. The difference in the reflection the lips make should be noted. We must remember the influence that a highly glazed or a fairly roughened texture of the enamel may make. The high light will be modified by the amount of convexity of the surface that is exposed to the light.

Finally, as to the indications for porcelain jacket crowns, I feel that they are called for in the following cases: peg lateral incisors, rotated anterior teeth, mottled teeth that are disfiguring, protruding incisors that are separated, teeth in which one-fourth to one-third of the crown requires restoration, teeth that have been denuded of enamel and have had gold crowns on them and, teeth that are badly eroded; or in cases where it is advisable to open the bite.

DEFINITIONS

Esthetics. The science which treats of the beautiful, and its various modes of representation in nature and art; the philosophy of the fine arts.

Angle. The difference in direction of two lines which meet or tend to meet. The lines are called the sides, and the point of meeting, the vertex of the angle.

Apparent color. The color which any object appears to have.

Appearance. The image produced in the eye by the form, light and shade, or color of any object.

Brightness or luminosity. The strength of the light sent to the eye by any color. A luminous or bright color sends a large amount of light to the eye.

Broken color. Color changed by the addition of gray.

Cold colors. Those in which blue predominates.

Warm colors. Those in which red and yellow predominate.

Color. The result of the decomposition of light into the various elements composing it. It is a sensation due to the effects produced on the eye by the waves of different length found in light, and does not exist outside ourselves.

Practically, we speak of material color as that which decomposes light, and most objects are colored in the sense that they decompose light and send to the eye rays which are not white. Thus, a body which reflects all the rays equally is white; one which absorbs all the rays except the red rays is red; one which absorbs all the rays except the blue is blue, and one which absorbs practically all the rays is black.

Gradation. A gradual change from light to dark, or from one color to another.

Light. The agent which produces vision. Light is supposed to travel in straight lines by means of minute undulations or waves in the particles of ether which fill all space. A ray of solar light is composed of a large number of differently colored rays of light which, uniting, form white light.

Light, mass of. The entire surface whose effect, in contrast with the shadows, is that of strong light. It is designated by the word "light."

Light, high or glitter. The brightest part of any surface—the part that glitters.

Light, half. The part intermediate in value between the shadow and the light.

Light, direct. Rays from the sun, moon, or any artificial light; in a studio, or operating room, rays from the window.

Light, indirect. Rays reflected to any object from surrounding objects.

Local color. The actual color of the light which is not absorbed by any object. This color is visible when the object is near the eye and does not reflect colored light received from any other object.

Level of the eye. The level or position of a horizontal plane passing through the spectator's eye.

Model. An object used for study.

Neutral color. Color which is not pure or bright.

Perspective. The art of representing on a surface the appearances seen from any given position.

Pure or normal colors. The spectrum colors.

Reflected light. The part of the shadow of any object which is lightened by rays reflected to it from some other object.

Shadow. The part of any surface which appears dark in consequence of receiving direct light.

Shadow, cast. The shadow projected on one object by another.

Tone. Tone designates the changes which color undergoes by the addition of white, which lightens, or of black, which darkens, its normal tone. The word also means the effect of some predominating color produced by the color of the light which illuminates the object. Self-tones are tones of the same color.

Visual angle. The angle formed at the eye by the outer visual rays from any object.

DISCUSSION

Nye W. Goodman, Los Angeles, Calif.: It has been said that the crowning glory in the art of any civilized country is that on naturalism. No place in the practice of our profession are we called on to give a more striking example of naturalism than in the department of ceramics in dentistry, and what could be more realistic than the perfect restoration of a dental organ which has, by its attendant vicissitudes, been shorn of its beauty and naturalism? Albert LeGro, in his recently published work,[1] makes the statement, in his opening chapter, that, in the use of porcelain, we have a branch of restorative dentistry that opens greater possibilities than any other with which we are now familiar. Many operators in our profession have labored, and are laboring, under the impression that dental ceramics is a highly specialized branch of our work which should receive the attention of only a chosen few. To the contrary, it should, since porcelain is the only material we have today which simulates the natural tooth structure, be given the greatest consideration by every operator who today is doing restorative work. For those who have had little or no experience in the handling of porcelain, it is a fatal mistake to undertake difficult restoration without first familiarizing themselves with the technic and materials to be used. In speaking of the essentials for ceramic work, mention is made by Dr. Avary of the necessity of a definite technic, good light and proper color on the walls of operating room. A technic for removing the enamel by cutting in squares or blocks and then removing these by use of a chisel is given. This technic, in skilful hands, will give favorable results, but in the unskilled hand is dangerous for the reason that the thin knife-edged stones may easily cut too deeply into the tooth structure and thereby endanger the pulp. Also, small grooves may be cut into the dentin, which will preclude the possibility of a perfect impression. The use of the right and contra-angle hand-piece should be avoided wherever it is possible to use the straight hand-piece, since the latter permits of more perfect control and its use is attended with less vibration. This rule should apply in all operations in

1. LeGro, A. L.: Ceramics in Dentistry, Brooklyn: Dental Items of Interest Publishing Co., 1926.

the mouth, and more especially in the six anterior teeth which are, at this time, under consideration. Coating the freshly prepared surfaces of dentin with a resin-chloroform varnish is an excellent procedure. This varnish is prepared by dissolving violin resin, which is a pure form of resin, in chloroform. This solution can be made very thin and does not leave a thick gummy surface as do many of the cavity varnishes on the market today. The practice of covering the prepared tooth with guttapercha or temporary filling comes in for a generous amount of criticism as this material (1) is not sufficiently rigid to withstand the stress of mastication; (2) does not permit of close perfect adaption to the gingival tissues and retaining same; (3) is unsightly when used to restore the entire enamel covering, and (4) leaves the tissues in a highly inflamed condition, making the proper cementation of the finished crown very difficult. May I suggest at this time a method which obviates all the undesirable features above mentioned. After the tooth is prepared and coated with varnish, it should be protected with cotton rolls. A wisp of cotton saturated with epinephrin and wrapped around the tooth at the gingival will check the weeping of the tissues. Select the proper shade of synthetic porcelain. Mix to a consistency that can be handled in the fingers; remove the wisp of cotton; dry the surface of the tooth; place the synthetic porcelain on the surface of tooth, first coating the fingers with cocoa butter to prevent sticking, and with the fingers and a suitable plastic instrument form the tooth, gently tucking the silicate around the shoulder, forcing the gum away. This will harden by the time we are through working it, and when the patient returns, it will be easily removed by the use of a thin disk cutting through nearly to the tooth surface and dislodging the silicate by the use of a chisel. The gingival tissues will be found in perfect condition and the least possible difficulty will be encountered in the cementation of the crown. Raising the bite by the use of only porcelain jacket crowns is a procedure which should be undertaken only after thorough consideration and study of the case at hand and then only after some considerable practice in the use of porcelain. I should advise strongly against this undertaking by those lacking experience in the preparation of the tooth and without knowledge of porcelain and its application. Much of the criticism which has come to porcelain work is due not to its use but to its abuse. Dr. Avary has touched on impressions, and to this step in our technic more than to any other doubtless can be traced the cause of our failures. Dr. LeGro, in his chapter on impressions, says: "The development of hundreds of good dentists and technicians has been aborted through the medium of poor and inadequate impressions. Laboratories design and build scores of wonderful and fearful contrivances, on casts or dies, procured from impressions that are totally unfit to be used, all because the operator has failed in his ideals, the loss of which has so warped his perspective that even a so-called fair impression is beyond him. Be exacting with yourself in taking impressions, and the preparations will improve and the finished work will be of the best, with the added conviction that perfect impressions make your work a joy, and that to your other assets you have added dexterity and expertness. Be content with only those impressions which will stand the eagle eye of the magnifying glass, which means only perfection, in so far as human hands are capable of acquiring it." Study models and radiograms will be a great aid, but the latter should not be too much relied on in determining the proximity of the pulp, as angles are frequently somewhat distorted, and such fine deductions would be dangerous. A thorough knowledge of tooth anatomy will serve well in this class of work. The making of the matrix is also another step which requires a definite and skilful technic and is deserving of a most detailed consideration. Few operations in dentistry require the same amount of fine detail as do the various steps in jacket-crown construction, and mastering this technic should do much to better fit us for other delicate operative procedures. Dr. Avary states that he cannot too strongly criticize the men who advocate the use of the shoulderless jacket crown. It is my impression that he intended to criticize the principle of this type of restoration and not so much the men who use it. There are able men who believe in the use of the shoulderless jacket crown, and they are getting excellent results in many cases and especially in such cases as the undeveloped or peg teeth, which are so often presented to us. I have made many restorations of this particular type with most gratifying results and strongly recommend that those who are

interested in porcelain work familiarize themselves with the technic, which is very simple and is only a slight modification of the shoulder technic. One of the objections stated was that the thick feather-edge under the gingivae would be apt to cause recession. Instead of the thick feather-edge, I would recommend the well-rounded and well-formed enamel shoulder, which should extend well under the free margin of the gum and create a slight tension tending to keep this tissue in an excellent condition and prevent its recession. The placing of the gingival tissues under this slight tension in all types of crown restorations, provided great care is taken in producing perfect margins, will be found conducive to the health of the tissues. Reducing the peripheral measurement at this point allows the tissue to become very sluggish, since there is a loss of tissue vibration due to the lack of tension. In no other phase of our profession is the evolution of progress moving with greater rapidity, and new interest is being created all around us. With this apparent interest and progress, it is certain that new stars will come into the ascendency and will contribute much to the art of porcelain work. The survival of the fittest is one of the major tenets of those who study the progress of all lines of endeavor, and the professional man or woman who is ministering to the public may well keep this principle in mind in seeing that his work is correctly designed and will meet the conditions for a healthy existence.

W. D. Vehe, Minneapolis, Minn.: It is true that much is expected of the ceramic worker by the patient and it really is well that this is so, for when porcelain is desired for the restoration of a tooth, it at once implies that the operator will discern and represent Nature's effects. Technic is the method or style of performance in any art. As such, it is not the point of serious contention, for it does not matter much how we set about to accomplish a task provided we complete it in the highest order, in the most convenient manner to ourselves and patients and in the shortest possible time. The differences really lie in the basic conception that we possess, the ideal that we have in mind of the completed work, and, with this in view, technic may indicate whether or not this same high standard is the goal. Dr. Avary has given an admirable description of his technic for the veneer crown, and his attempt at classification of tooth conditions to facilitate a restoration may be a step in the right direction. His description of a finished preparation is that it should simulate the original contour of the tooth. That is precisely what it should look like, to make for an even thickness of porcelain in the crown with a minimum of tooth destruction. In working with students and beginners, one can quickly see what their tendencies are in this direction, and the prediction can almost always be made that there will be too wide a shoulder at least in places, and an insufficient removal of tooth structure from the lingual fossa and from the labial incisal third of the anterior teeth. Such a procedure does not well simulate the original tooth contour, and it is faulty in that it provides for thin areas in the crown with possible color difficulties. Dr. Avary's teaching as to shoulder width is fine, and his contention that all preparations should have a definite shoulder no matter how small it is necessary to make it is sound. The enamel rods do not come to the surface at a right angle to the long axis of the tooth in this region, but their general direction is about 6 degrees centigrade gingivally. To best contend with this condition, it is my policy to plane the enamel shoulder so that it is at right angles to the original surface rather than to the long axis of the tooth as he does. This does not result in a bevel for the enamel nor for the porcelain margins. One of the finest aids an operator can possess in his laboratory, either for his own use or that of his assistant, is a series of natural teeth that are fairly representative. Too many operators still do not avail themselves of this information and consequently follow their own conception of tooth form, erroneous as it so often is. In building the veneer crown, such knowledge as can be gotten accurately at first hand is most valuable, but the real requirement, after all, should always be to build for the harmony and particular needs of the individual patient. To facilitate my own work, I always insist on having good, accurate casts that have the fine markings preserved. A modeling compound or gutta-percha restoration placed on the preparation and a plaster impression taken over this to include the adjoining teeth together with the tooth or teeth that are to be the particular guides provides for just such casts. There are other methods that are just as accurate,

but my experience with a wax bite is that it does not favorably compare with a good plaster impression in these important details.

Dr. Avary's desire to build and then biscuit the cervical color before placing the incisal or occlusal color thoroughly coincides with my desires in color interpretation. In building this work, it is important to get the porcelain thoroughly condensed in the crown. Actual tests for density show that there is quite a difference in this respect in the different methods of condensing it. There is no question that the vibration method when properly done yields the greatest density and the least amount of contraction. The spatulation method comes next in the line of densities, but it has the most contraction while the whipping method is lowest in density, although it has a little less contraction than the spatulation method. It seems that the amount of contraction of the porcelain in fusing is fairly indicative of its density. The color problem can easily be the most difficult part of a porcelain operation. That is one side of it. If it is understood and systematized, it can be made to be as positive and easy as any part of the procedure. Some one has well said that facts are the tools with which we carve our destinies. On analysis, it is evident that our only contact with facts is through our senses, of which the eye is unquestionably the most important. There is no question that color training will enable one to have better color perspective qualities. It will be easier for such an individual to discern the finer gradations of color. Dr. Avary stated that more than 4 per cent of the applicants for employment on the Pennsylvania railroad were found to be color blind. That is not surprising. I believe that authorities give this percentage, when taken generally, as about 5 per cent, with a ratio of four men to one woman. This difference is believed to be accounted for by the color training a woman necessarily gets from her more colorful apparel and surroundings. Whether color training would reduce this percentage in men is a question. The fact remains that the subject of color, which we are obliged to be in contact with daily and in which we express ourselves consciously or unconsciously whether we wish to or not, is sadly neglected. The important points in the technic for obtaining proper color in our restorations is, first of all, to see the colors correctly; then to take porcelain colors that accurately simulate these and place them in our restoration as we found to be indicated by a study of the tooth before hand. That is all that there is to it; for when the work is properly fused, the cementing medium should not change the color to any great extent, when carefully selected. The procedure in arriving at this should be, first of all, to verify the color guide. The discrepancies that often exist between the manufacturer's color guide and the colors with which we are furnished are so great that, in many instances, accurate color cannot be obtained, no matter how carefully the work may be performed otherwise. This is easily done and spells better color interpretations. In our color selection and study, the making of a proper diagram, as Dr. Avary contends, is the best procedure. This diagram should contain the patient's name, the date and a sketch of the labial or buccal outline of the tooth in question. On this diagram, the extent and outline of the cervical color should be posted, together with a record of the color that is to be used. The same should be done for the incisal or occlusal colors, and any other data, such as staining directions or special markings, may be included. In the cementation of the work, my experience differs somewhat from that of Dr. Avary in that I seldom can use a white cement. It is my experience that I get better color effects when I use a cement that is as near the cervical color of the tooth as possible. For this purpose then, when I use ceramic cement, I incorporate a golden or orange colored cement powder to give it the tooth color. My most pleasing experiences have been with a special yellow-white cement. The words "yellow-white" do not accurately describe the color of this cement, for it has an elusive orange shading to it. Naturally, the lighter in color the crown is, the more careful one must be in the choice of the cement and, conversely, the darker and more opaque the color of the crown is, the less effect the cement can have. This procedure as it has been outlined is a common sense progressive process, and all can master it reasonably well by proper application.

SURGICAL-ORTHODONTIC CORRECTION OF A MACROMANDIBULAR DEFORMITY: REPORT OF A CASE*

By LOUIS SCHULTZ, D.D.S., M.D., Chicago, Illinois, and R. C. WILLETT, D.M.D., Peoria, Illinois

THE patient, C. C., a girl, aged 19, was referred to me† by R. C. Willett, about two and one-half years ago.

History.—The mother died of tuberculosis. Other members of the family were tuberculous. The family history was otherwise negative. The patient had rachitis, and later, at three different times, sustained fractures during play from falls which ordinarily would not have resulted in any serious injury. She suffered from an inferiority reaction, of the type rapidly leading to manic-depressive psychosis, the depressed phase.

Examination.—The patient was emaciated (Fig. 1) and suffered from anemia, due partly to chronic hypertrophy and infection of the tonsils, and partly to inability to masticate. The occlusion was related to one upper molar on each side (Fig. 2). All other teeth failed to meet. The lower incisors projected 1 cm. in front of the upper incisors. The chin was too low and too prominent. The deformity developed gradually, beginning during the period of first dentition and continuing to develop until the patient was about 17 years of age. The arch of the upper jaw, and the roof of the mouth, were within normal limits. An absence of other bony enlargements, the age of the patient, the time of onset, etc., precluded a diagnosis of acromegaly.

Comment.—The indications for surgical interference were threefold:

1. To establish occlusion of lower with upper teeth so that the patient could masticate food.

2. To correct the deformity—a question of esthetics.

3. Most important of all, to change the mental complex.

The right lower second molar had been extracted just before the case came under my observation (Fig. 3), and because the left lower first molar was pulpless, contained incomplete root canal fillings and showed rarefied areas around the apices, I had that tooth extracted. I asked Dr. Willett to retain both spaces. The lower third molars were in process of eruption. The tonsils were removed about the same time.

I felt that neither Babcock's operation, consisting in severing the ramus horizontally above the mandibular foramen, nor the technic employed by Harsha, removing a rhomboid section from the body of the jaw between the

*Read before the Section on Orthodontia at the Seventh International Dental Congress, Philadelphia, Pa., Aug. 26, 1926.

†The surgical phase of the case is presented by Dr. Schultz.

last molar and the ramus, would produce the best results in this case. The former would cause an appreciable gap in the ramus when the resected segment was raised to bring the anterior teeth in occlusion. In healing, this would tend to separate the anterior teeth during the period of contraction of the maturing tissue. The latter was not feasible because there was not sufficient room between the last molar and the ramus to remove a rhomboid section of proper size. Nor did Gilmer's method seem adapted to produce an ideal result in this case, since the lower molars containing vital pulps were in good position anteroposteriorly so far as occlusion with the upper ones was concerned. I decided, therefore, on an operation along the lines followed by Blair, but instead of having the normal bicuspids removed, I preferred to accept the handicap of a larger anterior fragment, deprived of its principal blood supply, for the sake of utilizing the space created by the extraction of the right lower second molar and ridding the patient of a questionable lower first molar. The rest of the lower teeth contained vital pulps.

The patient came to Chicago, June 15, 1925. I studied the relation of the lower to the upper teeth, and prepared two wedge-shaped patterns, one for each side, marked "right" and "left," respectively, since there were slight variations between the right and left sides. Figure 4 shows the scientific manner of preparing patterns for the correction of such deformities. Mine were not prepared in that manner, except that I made the widest part of the patterns correspond to the actual protrusion; hence, the patterns were 1 cm. at the widest end. At the time of the operation, I had them included with the instruments for sterilization.

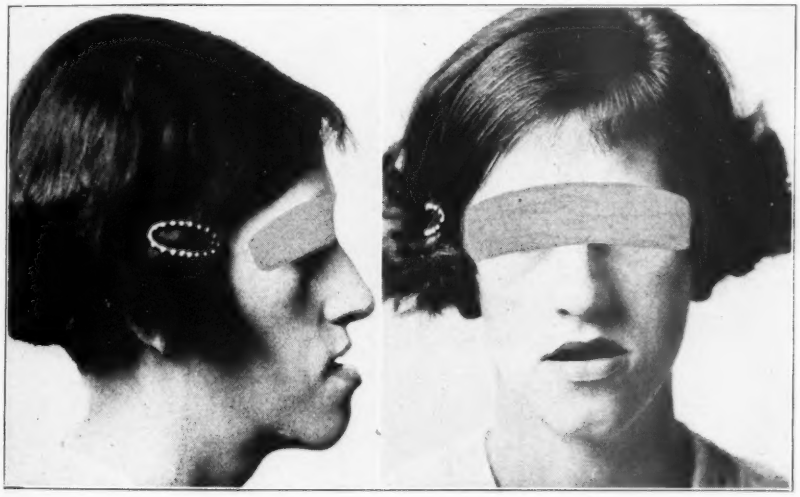

Fig. 1.—Appearance of patient before operation.

Operation (June 16).—Aseptic ether anesthesia was employed. A longitudinal incision 2 inches long was made in the shadow line of the jaw, down to, but not including, the periosteum.

The external maxillary artery was cut on the right side and both ends were tied. (Fig. 5.) The tissues were stripped up from the jaw to a point half way between the lower border and the alveolar crest, on both the buccal and the lingual surfaces. The periosteum was divided at that level and all the soft tissues were peeled from the bone, care being taken not to penetrate into the mouth cavity at any point.

An assistant placed his finger in the mouth of the patient and in the space caused by the extraction of the molar, thus guiding a small dull-ended instrument which I introduced through the wound into the center of that space. With this aid, I placed the copper plate pattern for this side in position, and with a scalpel marked off the section to be removed.

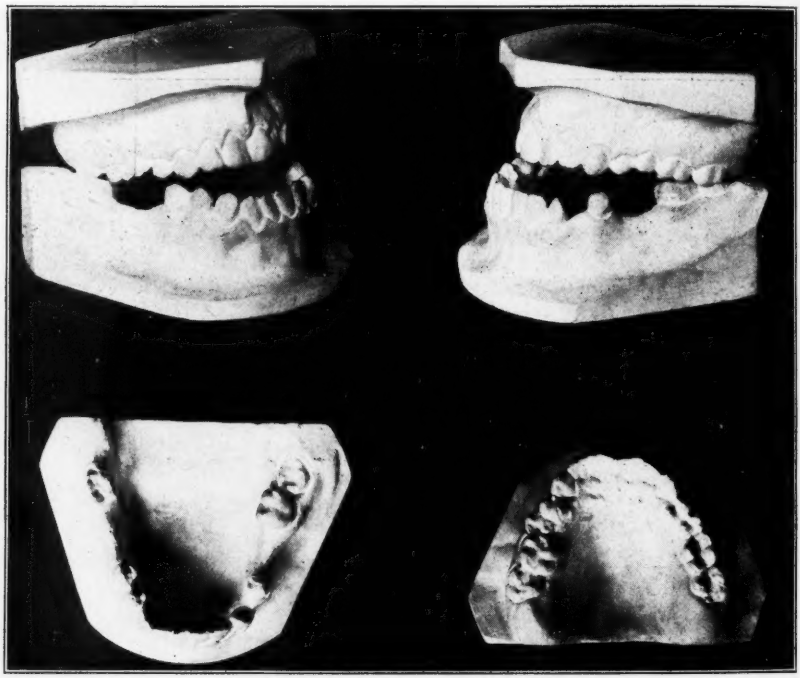

Fig. 2.—Casts of mouth made before operation.

A crosscut fissure bur, revolved by a dental engine, made both cuts through the external plate. (Fig. 6.) With a chisel, I connected the cuts at the lower border and pried out that section of bone, bringing the inferior alveolar vessels and nerve into view. Passing a

ligature under these structures, I tied them out of the way.

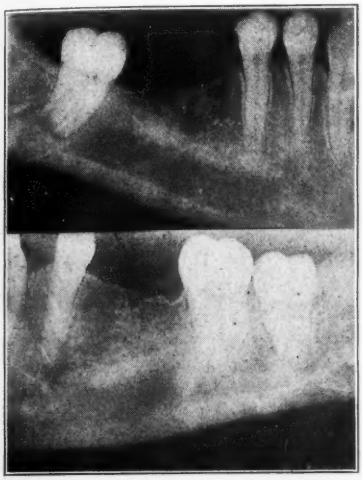

Fig. 3.—Above: right jaw; below: left jaw.

The same technic was repeated on the left side, but I dissected out the external maxillary artery on this side, and tied and cut it between the ligatures. (Fig. 7.) I then removed the remaining portion of the section of the left side with rongeurs and bone cutting forceps after drilling a hole through each segment near the lower border for the purpose of immobilization. In removing this portion of the bone, I inadvertently cut the vessels and nerve, so I excised all of the exposed portion.

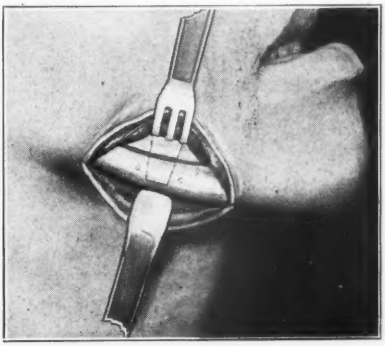

Fig. 5.—First step in bone resection.

Instead of silver wire, I used kangaroo tendon to hold the fragments in apposition, securing the ends in a hemostat after adjusting the first loop of a surgeon's knot. The other side was then finished in the same manner, except that I did not cut the vessels and nerve, but instead cut a groove in each fragment and looped the nerve and vessels on the buccal surface of the bone. The anterior fragment was then brought back

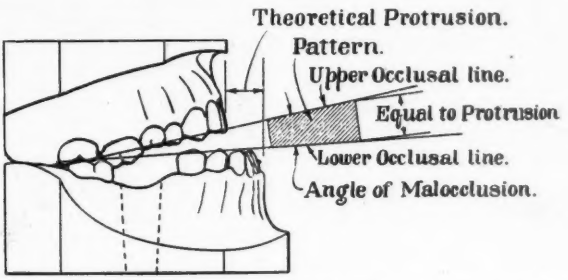

Fig. 4.—Formula for determining amount and angle of resection of lower jaw.

and up so that the teeth occluded, and Dr. Willett locked the teeth in position with a bar fastened to bands that he had

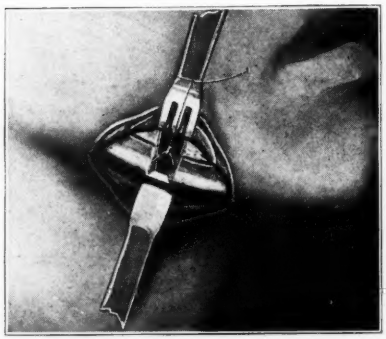

Fig. 6.—Second step in bone resection.

previously cemented to the teeth, an appliance and method of his own which he will describe.

At this time, the distal end of the truss on the right side was bent lingually, in order to correct the buccal

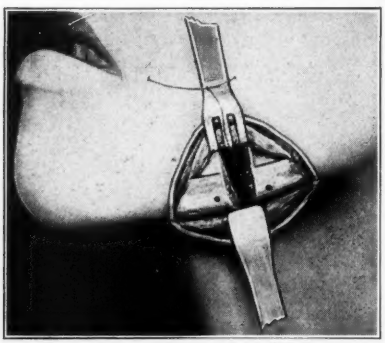

Fig. 7.—Third step in bone resection.

relation of the molars. The kangaroo tendons were then tied and the wounds closed. (Fig. 8.) The cut ends lined up perfectly, though the lower border of the jaw did not, but no attention was paid to that, for good occlusion was paramount. Figure 9 shows the occlusion before and after operation.

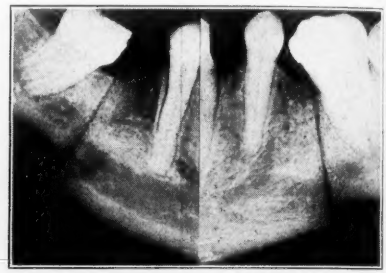

Fig. 8.—Views of resected bone.

Postoperative Treatment.—This consisted in wiring the lower teeth in occlusion with the upper ones after all danger of nausea from ether had passed. The application of cold to the wound for the first twenty-four hours was fol-

Fig. 9.—Cast taken after operation. (Compare Figure 2.)

lowed by boric acid fomentations and irrigation of the mouth with hot boric

acid solution. There was no elevation of temperature, no swelling and no pain.

On the fifth day, I removed the stitches to prevent scar formation. On the eighth day, the left side pained, became swollen, and opened, discharging pus. On the ninth day, the right side did the same. Discharge stopped on the right side in two days, and the wound healed. The left side kept discharging for a month, when the kangaroo tendon came away and it closed. A month later, two small sequestra were cast off, and the patient went home.

Results.—The jaws united on both sides with splendid masticatory function (Fig. 10), because the teeth were placed and held in good occlusion. The rontgenogram (Fig. 11) made nine and one-half months after this operation shows almost complete obliteration of the line of resection by bone. Tonus and feeling returned in the lower lip during the first week, the side where the nerve and vessels were cut being more advanced in its return to normal than the other. Figure 12 shows scars on the right and left sides resulting from suppurating wounds.

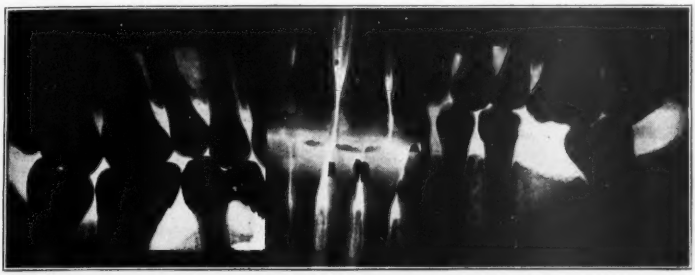

Fig. 10.—Views taken after operation.

Figure 13 is a photographic profile view of the patient at present on which a pantographic drawing is superimposed, the photographic view as it was before the operation being used in order to outline the correction in the most accurate manner. It shows an exact reduction of the chin of 10 mm., corresponding to the upper width of patterns used in the excision of the jaw.

Five months later, the patient returned and both scars were removed (Fig. 14), the wounds being closed with Halsted's subcuticular suture. Recovery was uneventful. Figure 15 is a profile and front view of the patient before and after the operation, showing what has been accomplished.

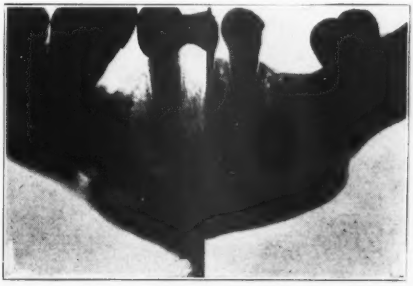

Fig. 11.—Union of bone after operation.

The result obtained was made possible only by close cooperation with Dr. Willett, the orthodontist, who cared for the immobilization of the fragments, etc., after the patient went home. Indeed, I feel that, with such splendid cooperation, all other fixation methods, contemplating the lashing together of the bone fragments by means of kangaroo tendon, silver wire, etc., passed through previously drilled holes, may well be dispensed with, always provided the patient has a sufficient number of firm teeth on which the appliances may be cemented.

End-Results.—The three indications were met:

1. Firm union, perfect articulation and splendid masticatory function were obtained.

2. The deformity was entirely corrected.

3. The desired mental change resulted; for whereas the patient, prior to our treatment, was a mental liability, she now appears as a mental asset, a comfort to herself and her friends.

ORTHODONTIC AND POSTOPERATIVE PHASE OF THE TREATMENT‡

Dr. Schultz has well stated the threefold reason and need for the correction made in this case. In the presentation of a detailed report, the object is to show definite evidence in proof of results obtained through a close cooperation of the oral surgeon with the orthodontist, in their attempt to solve correctly a serious problem, involving the occlusion of the teeth, the proper functioning of the jaws and the outward physical appearance of the patient.

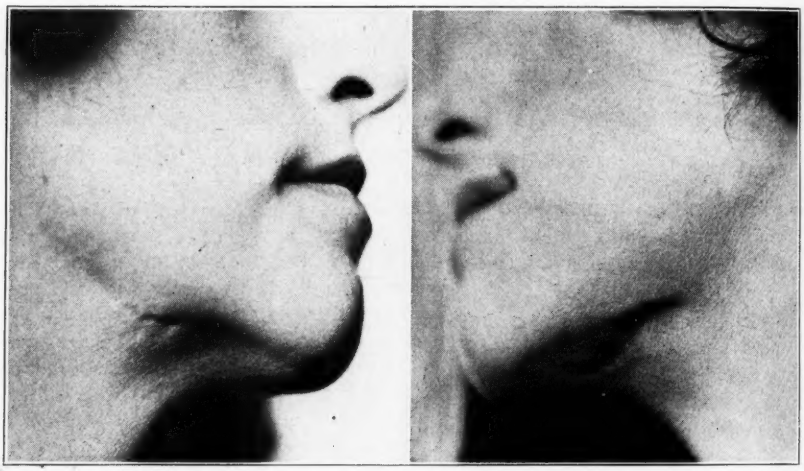

Fig. 12.—Scars remaining after operation.

Up to the present time, the relation existing between the oral surgeon and the orthodontist has been that of a mild and friendly interest, rather than one of

‡This phase of the case is presented by Dr. Willett.

enthusiastic, mutual research and study, with final effective collaboration in action; and this line of professional demarcation has been particularly regrettable in cases in which a common sense view of the problem presented showed plainly that the two fields were involved, and overlapped.

Fig. 13.—Graphic drawing showing extent of operation.

Preliminary Consideration of the Case and Its Treatment.—The severity of the deformity of the mandible, and the malocclusion of the teeth, being beyond the scope of orthodontic treatment, a surgical operation was imperative.

We sought the advice of Louis Schultz, of Chicago, who entered the case, and together, for more than two years, we made a careful study of the conditions, and carried to completion, the preparation of our patient for the proposed operation—a bilateral resection of the mandible.

The preparation for the final operation included preliminary treatment and a tonsillectomy; also the extraction of all pulpless teeth of the mandibular arch. The reaction of the patient to

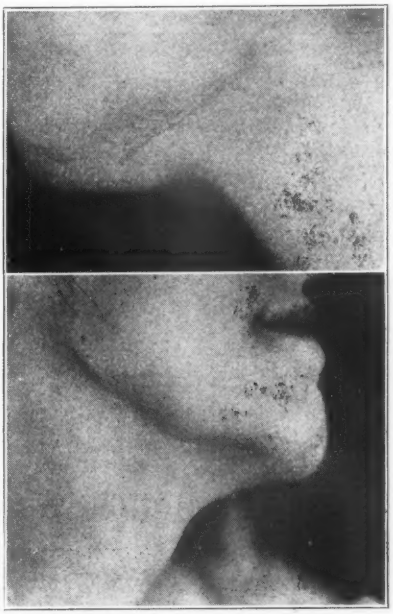

Fig. 14.—Further healing of scars.

anesthetics, and her susceptibility to infection, was carefully noted throughout these minor operations of preparation.

Final Preparation. — During the month of May, 1925, final preparations for the operation were made. Plaster models were made and the base of the lower model was cut to fit accurately a metal track base (Fig. 16.), and was mounted upon it (Fig. 17), before the setting back of the anterior section (Fig. 18).

Allowance was made for the imperfections of occlusion due to the perpendicular cut, and the buccal malposition of the mandibular right third molar. These conditions would be improved in the actual operation on the patient by following more scientific lines, as determined in the formula (Fig. 4); also in the adjustment of the postmaintenance appliance (to be described later), which corrected the buccal malposition of the right third molar (Fig. 19).

The appliance was designed to meet the individual demands of this particular case, rather than to be a copy of any type of apparatus previously used by other operators.

The selection of suitable materials was of utmost importance. Precious metal alloys of gold and platinum, which would not corrode, nor in any way produce unhealthful conditions of the soft tissues, were used.

Fig. 15.—Views of patient after operation.

Construction of the Appliance.—The next problem in the work of preparation was the construction of a maintenance appliance that would meet all requirements of the proposed operation and postoperative treatment.

Five Essential Features of the Appliance.—1. The anchor bands were of sufficient strength to resist any necessary stress applied in adjustment or *during fixation.*

2. All soldered and adjustable attachments to the anchor bands were cemented on the teeth in advance of the

surgical procedure, and so placed that they could not interfere in any way with the resecting operation.

3. All connecting parts of the mandibular appliance were so designed as to insure their easy assembly; and certain parts were so constructed as to allow some range of clearance, while remaining under control for the postoperative immobilization.

4. The appliance was so constructed as to be removable in sections, in case it should prove advisable to retain one side in partial or complete fixation for a longer period than the other.

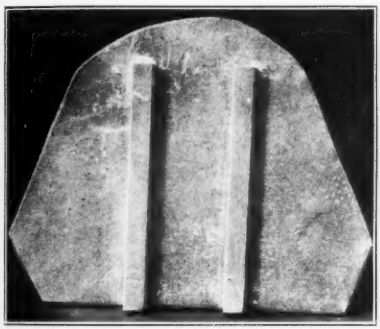

Fig. 16.—Metal track base.

5. In view of postoperative catastrophe, such as nausea, the fixation of the jaw was made certain; and to this end, the rigidity of the assembled appliance, mounted on resected plaster casts, was thoroughly tested. With such an appliance for the mandibular arch, the ligating together of the jaws could be dispensed with, until all danger of nausea or coughing should have passed.

The Appliance and Its Working Parts.—The maxillary appliance: Heavy coin-gold bands were made and fitted to the first molars; buccal tubing, of 0.040 inch bore, closed at the distal end, was soldered on the buccal side for the reception of the alinement wire.

Gold alloy bands were made for the central and lateral incisors, with hooks open to the cervical soldered in a central position on the labial side. When the alinement wire was in place, it rested in the hooks, serving as an attachment when the jaws were ligated together (Fig. 20).

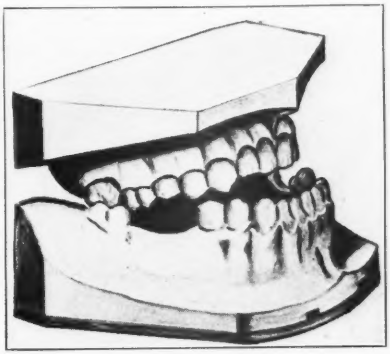

Fig. 17.—Cast showing original condition, on metal track base.

The mandibular appliance: Heavy coin-gold bands were made and fitted to the right third molar and bicuspids, the bands being united. The same preparation was made for the second molar, first bicuspid and cuspid, on the left side, the bicuspid and cuspid bands being united.

Two vertical tubes, of 0.035 inch bore, were soldered in a vertical position on the buccal side of each molar band. An open-sided tubing of sufficient size to receive a clasp metal wire (truss) 0.055 inch, was soldered in a

horizontal position on the buccal side of the united right bicuspid bands.

A sleeve was fitted to the mesial end of the open buccal tubing, with a tongue of metal that fitted into the open space of the open tubing. A hold-down lug was soldered to this sleeve, and served two purposes: first, that of stabilizing the sleeve when it was placed over the end of the tube; and, second, that of serving as a resting place for a wire ligature in the final assembling of the appliance. A similar hold-down lug

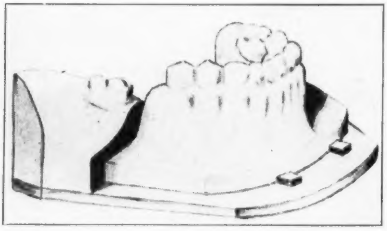

Fig. 18.—Cast, on track base, cut and resected 10 mm.

was soldered to the heavy truss, so placed that it rested in the buccal occlusal groove of the molar. That end of the truss wire was supplied with two pins on the distal end, which fitted without binding in the vertical tubing on the buccal of the molar band. The left side was supplied with the same type of attachments.

The four anterior teeth were covered with a thin veneer casting of high platinum content. Four hooks, open to the cervical, were soldered to serve as an attachment in the process of ligating the jaws together, as has been previously shown (Fig. 20). This illustration also shows the manner in which the sleeve fitted the mesial end of the open tubing when the truss was in place. The parts composing the complete appliance are here shown (Fig. 21).

In order to supply a range of adjustment, and to allow for the unavoidable variation in the actual operation, from that of the resection made on the plaster cast, the mesial end of the truss wire was a few millimeters short of reaching the closed end of the sleeve

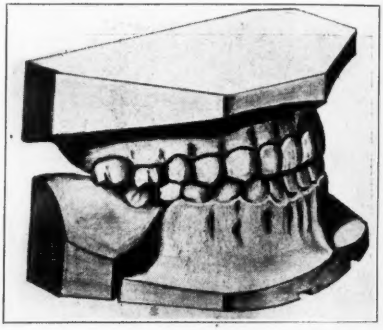

Fig. 19.—Cast showing adjustment made by bending truss, to correct buccal relation of molar, on right side.

cap. This is shown in assembled cross-section view (Fig. 21 *G, C, H*).

With the maxillary appliance completed, and that part of the mandibular appliance which consisted of the anchor bands securely cemented in place (Fig. 22), the patient was ready for the operation, which was performed by Dr. Schultz, June 16, 1925.

On August 4, the patient returned to Peoria for further postoperative treatment, and for care looking toward safeguarding the result of the operation thus far. A slight loss in weight had occurred since the operation. For

the purpose of improving her nutrition and hastening bone repair, directions were given for a semiliquid nourishing diet, and phosphorized cod-liver oil and calcium lactate were prescribed. The patient was advised to exercise freely and to keep in the open air as much as possible.

Twenty-four days later, August 28 (the date of her next visit), the patient showed a gain of 5 pounds.

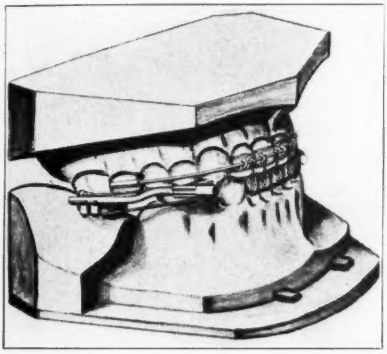

Fig. 20.—Cast, showing appliances and jaws as ligated.

Bone consolidation on the right side gave assuring evidence of a satisfactory union, and the appliance was removed from that area without disturbing other parts. As we have heretofore stated, much thought had been given to this feature of the appliance during the time of its construction.

The left side of the jaw was inclined to sag and the occlusion of the teeth on that side was not satisfactory. Advantage was taken of the fibrous union by religating the jaws on that side, tightly enough to bring the teeth into correct occlusal relation. The parts were thus held in fixation for two weeks. Conditions then seemed to favor a partial retention. October 24, four months and eight days from the date of operation, all appliances were removed from the teeth. In November, the patient's weight had increased to 118¾ pounds, a gain of 9 pounds over her weight as recorded at the time of the operation. The nutritional aid of the cod-liver oil, and other remedial agents

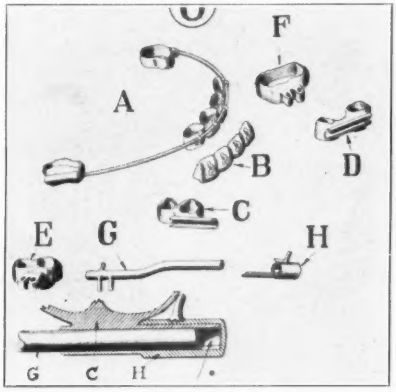

Fig. 21.—Parts composing complete appliance: For maxillary arch: *A*, labial arch wire (0.040 inch) with assembled anchor bands and attachments. For mandibular arch *B*, hard gold, one piece, cast overlay for incisors. Hooks on labial open to cervical. *C*, right bicuspid bands (united) with open side buccal tube, 0.057 inch bore. *D*, left cuspid and first bicuspid bands (united). The buccal tubing is the same as *C*. *E* and *F*, right and left molar bands with vertical buccal tubes, 0.036 inch bore. *G*, truss, 0.055 inch, with pins of 0.035 inch gage and hold-down lug on the distal end; one each for right and left sides to fit into the vertical tubes on *E* and *F*, the mesial end to fit in the buccal open tubing of *C* and *D*. *H*, sleeve with hold-down lug and finger for truss. *G*, *C* and *H*, assembled cross-sectional view showing clearance for adjustment.

was now dispensed with, the patient was advised to follow a rational diet, and, as far as postoperative treatment of the deformity was concerned, the case was dismissed.

Although much preliminary study had been given this case, and the preparation of the patient for the operation was most carefully planned, we admit errors of technic; at least, some of the surgical and orthodontic technic involved would be applied in a different manner if our steps could be retraced.

One change would be in the mechanism of connecting the mandibular appliance, where the truss, in assembling, was first anchored in the molar buccal tubing, which was held in place by the hold-down lug when the wire ligature was applied. This arrangement seemed very simple indeed, in the process of assembling that part when the appliance was mounted on resected plaster models on the metal track base; but it proved to be anything but simple when it came to the making of that adjustment of the truss in the immobilization of the fragments, with the patient on the operating table; and its use was further complicated by mouth conditions following two hours of anesthesia and operation.

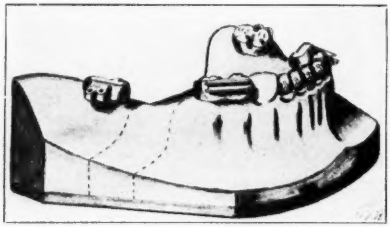

Fig. 22.—Cast, with anchor bands, as placed before operation.

As a suggestion to any operator who might copy our type of postmaintenance appliance, for a like or similar purpose, we ask that careful attention be given to the revised construction of the truss and its attachment in connecting with the molar anchorage (Fig. 23). Instead of passing the wire ligature over the buccal attachment on the molar anchorage, as was done in the appliance used in the correction of this case, the eyelet shown on the truss may be used to ligate the truss in place. This, it seems to me, should prove far less difficult of adjustment, while giving as firm a connection as the vertical pins and tubes.

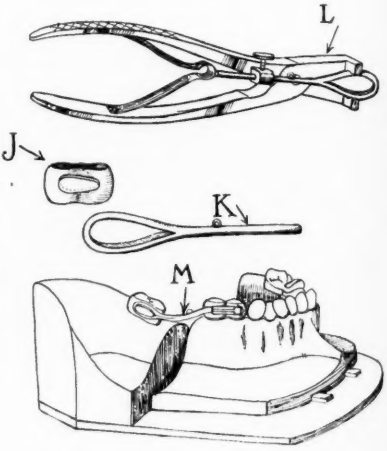

Fig. 23.—*J*, band with headed lug. *K*, proposed form of truss with loop end to fit over headed lug on buccal surface of molar band (*J*). L, special form of loop closing forceps with swivel block and set screw to hold truss from slipping while being carried to place and closed; swivel block to be reversed for right or left side. *M*, truss applied and loop closed on headed lug.

SUMMARY OF REPORTS ON DENTAL ALLOYS*

By WILMER SOUDER,† Ph.D., Washington, D. C.

NUMEROUS reports[1] from the Bureau of Standards on the properties of dental materials have appeared during the last three years. In general, these have been fairly complete on the item or subject considered. Terms used in reporting values have been defined and their significance pointed out. The practical significance of these findings has been shown in their relation to laboratory technic.[2] It seemed desirable to combine the findings announced to date in a summary or tentative specification. The subject "lingual bars" is also included in this summary, although no previous report has been made on this item.

In cooperation with other departments of the Government, there has been formulated a tentative specification for gold alloys. This is a strictly tentative standard. Unquestionably, improvements will be made in it at a later date. As it now stands, it makes possible a satisfactory selection at a reasonable price. As the technics of manufacture and use advance, changes can be made to cover the advances. This tentative specification will cause the rejection of many alloys as not satisfactory for the best restorations.

The specification is based upon information secured from two separate sources. The first is a canvass of a large number of the profession, including officers of the Army Dental Reserve Corps, made by the Surgeon General's office. Statements were secured from these men in which they named the alloys which they considered most suitable for the various types of restorations. These alloys and a number of others were tested and their properties compared. The second source is a theoretical consideration of the properties needed for efficient dental restorations. It was indeed gratifying to find how nearly the two agreed.

The data given in the accompanying table are the result of a combination of the practical and theoretical aspects of

†Physicist, National Bureau of Standards.

*Publication approved by the Director of the Bureau of Standards of the United States Department of Commerce.

*Read before the Section on Operative Dentistry, Materia Medica and Therapeutics at the Sixty-Ninth Annual Session of the American Dental Association, Detroit, Mich., Oct. 26, 1927.

1. This summary is to a large extent taken from the reports of the cooperative research between the Bureau of Standards and the Weinstein Research Laboratory, New York City. References to these reports are: Coleman, R. L.: Physical Properties of Dental Materials II (Wrought gold Alloys), J.A.D.A., 12: 520 (May) 1925; Dent. Cosmos, 68: 743 (Aug.) 1926, 69: 1007 (Oct.) 1927. Swanger, W. H.: Scientific Paper of the Bureau of Standards No. 532.

2. Souder, Wilmer: The Selection of Dental Materials, J.A.D.A., 14: 189 (Feb.) 1927.

TENTATIVE SPECIFICATIONS FOR DENTAL CASTING GOLD ALLOYS, LINGUAL BARS (WROUGHT), CLASP AND ORTHODONTIA WIRES

Use	Assay		Fusion Temperature	Brinell Hardness No.			Proportional Limit, Lbs./In.^{2}	Ultimate Tensile Strength, Lbs./In.^{2}	Percentage Elongation 2 Inch Gage Length	
	Gold, Silver, and Platinum Group	Silver		Quenched		Oven Cooled	Oven Cooled	Oven Cooled	Quenched	Oven Cooled
	Total Per Cent	Per Cent	Degrees C.							
	Minimum	Minimum	Minimum	Minimum	Maximum	Minimum	Minimum	Minimum	Minimum	Minimum
Inlays (Soft)	90	4	925	35	65				15	
¾ crowns, hard inlays, soft saddles	90		925	90	140		25000	45000	5	2
Cast clasps, bars	85		900				72000	90000	3	1
Single piece castings, hard saddles	80		875			175	72000	90000	3	1
Single piece castings of lower precious metal content	76		840				64000	80000	2	1
Clasp and orthodontia wires (wrought)	85		925					120000	9	4
Lingual bars (wrought)	75		875			185			Cold Bends 2	Cold Bends 1

this subject and are offered to the profession for their constructive criticism.

DETAILS OF TESTS, SPECIFICATIONS, ETC.

1. Specimens (casting alloys only). Test specimens will be prepared by the purchaser unless supplied by the bidder (as permitted by the next paragraph), and shall be in the form of round rods not less than 4½ inches in length and between 0.08 and 0.09 inch in diameter and shall be cast from the alloy. Specimens must not be machined or worked. Alloys which do not cast in dental investment into rods of the foregoing dimensions shall be rejected.

The bidder will be permitted to supply six cast specimens with sprue and button attached for the tests when he makes such request at the time the bid is submitted. Heat treatments shall be left to the purchaser. The agreement of the bidder's test specimens in composition, purity, etc., with the alloy supplied, shall be established by chemical analysis or such other methods as may be necessary.

A minimum of 30 dwt. of alloy is necessary for making acceptance tests on delivered material.

2. Specimens (clasp and orthodontia wires only). The successful bidder will be required to submit at the time of delivery, in addition to the alloy gold specified, test specimens in the form of No. 19 wire, American wire gage (B & S), 0.036 inch in diameter. These shall be in lengths of 6 inches or multiples of 6 inches. A total of 36 inches of wire shall be required. These wires shall be from the same alloy as the order delivered and must agree in composition and homogeneity of composition.

3. Color. A color specification may be included in the bid proposal by the purchaser stating the special color required, as, for example, platinum color clasp alloy.

In the absence of a specific color requirement, the color specification will be: "The color shall be the usual color of alloys commonly supplied for this purpose."

In all cases, the bidder must submit with the bid two specimens of each alloy or bar (each of 1 dwt. or over), which will be tested for the color requirement only before the award is made.

4. Heat treatments. *a*. (Quenched). Specimens shall be heated to 700 C. and quenched in water at room temperature.

b. (Oven cooled). Quenched specimens shall be reheated to 450 C. and cooled, in 30 minutes, to 250 C.

5. Fusion temperature. This is the lowest temperature at which a wire 0.020 inch in diameter and one-sixteenth inch long, supported at both ends, will break when subjected to a cross-bending load of 3 ounces. The heating rate, within 50 C. of the breaking point, shall be between 5 and 30 C. a minute.

6. Brinell hardness. These tests shall be made with a one-sixteenth inch ball, using loads of 14 pounds for hardness numbers of 50 or under and 28 pounds for hardness numbers over 50. The load shall be applied for a period of 30 seconds.

7. Cold bend (for wrought lingual bars only). The values given, 2 and 1, represent the number of times a bar shall bend, without breaking, around mandrels of 0.05 inch radius. These bends are made over vise jaws shaped to the specified radius. From vertical to horizontal (90 degrees) is called one bend. Back through vertical and to horizontal in the other direction gives a total of two bends. The tension on the specimen during the bending shall be approximately 20 pounds. The bends are made across the minor diameter of the bar section.

8. Shapes and sizes (for wrought lingual bars only). *a.* The ratio major diameter to minor diameter of the main bar section shall not be greater than 2½:1.

b. The ends of bars shall be roughened and shaped for the efficient retention of vulcanite attachments.

c. The weights, sizes and shapes of lingual bars are, of necessity, varied to meet as nearly as possible the needs of the operators. The purchaser should supply the data on minimum weight and minimum length of the bar, and these values should be written in the specification to cover the needs of the operators.

DISCUSSION

George M. Hollenbeck, Los Angeles, Calif.: Is fusion, up to a certain degree, a desirable quality for casting alloy? that is, a sufficiently high fusion, so that it can be readily soldered. You do not believe that the alloy should go through high heat?

Dr. Souder (closing): I believe the specification gives that. There is a fusion temperature for every one, below which it cannot go. We have never found it necessary to limit the height. There does not seem to be any desire to have a high percentage of platinum.

THE PATHOLOGY OF THE MAXILLARY SINUS AND ITS MANAGEMENT FROM THE DENTAL ORAL SURGEON'S POINT OF VIEW*

By T. A. HARDGROVE, Fond Du Lac, Wisconsin

AN important step in the consideration and management of antrum disease is an accurate diagnosis. This can best be arrived at after we have considered the type of tissue that is present in the normal antrum, because the diseased or pathologic tissue will be but a modification of the normal. The antrum is lined with a stratified columnar ciliated epithelium in which there are located mucous goblet cells, loose connective tissue and lymphoid cells. These special tissues all aid in the arrangement that lends quality and resonance to the voice and protection to the maxillary sinus against infection.

The patient's facial contour and the arrangement of the nasal and oral cavities should be noted to determine whether there is abnormal or pathologic arrangement that may interfere with normal drainage or that that has been provided in case of disease. It might too suggest a misplaced tooth, the presence of which a roentgen ray will detect.

The patient may or may not complain of sensitiveness in the region of the maxillary sinus or pain in the occipital region. But these symptoms may all be absent, this depending to a large degree on whether the drainage through the natural openings is interfered with. Fever is usually present, and, in the beginning, a fairly high leukocyte count, which, in the chronic cases, relapses to slightly above normal, as does the temperature, remaining at about 99 F., or a little above, most of the time. But many times, in the cases that are quite acute, the temperature is but little disturbed. In the beginning, there is an exaggeration of the pulse, which disappears as the infection becomes tolerant.

The general appearance and the symptoms complained of by the patient should not be lost sight of. There is usually a complaint of headache in the supraorbital region. The question of drainage as a symptom is important. The passage of pus from the antrum to the nasal cavity is as a symptom sufficient.

Transillumination will show a unilateral darkness except in those cases in which there is such a heavy bony arrangement that the transillumination does not penetrate well and a roentgen-ray picture is essential. In fact, a roentgenogram should always be taken. A comparative view of other sinuses will be an aid in the diagnosis. Absolute

*Read before the Section on Exodontia, Anesthesia and Roentgenology at the Seventh International Dental Congress, Philadelphia, Pa., Aug. 26, 1926.

and severe pain in the antrum indicates that there is an obstruction of the natural opening. It also indicates that there is a fairly active type of infection at work.

We should endeaver to decide as to the type of infection that seems to be present as this may determine the method of treatment. In all these cases of an acute nature, a large percentage, perhaps 70 per cent, can be traced to the oral cavity, as can many of the chronic cases.

The sources of infection from the mouth are varied. Infection at the apex of the root may force its way into the antrum cavity, this depending on whether or not this is the line of least resistance. The antrum is never irritated from a normal tooth merely because the tooth itself penetrates the antrum cavity. There is always a deposit of bone between the antrum wall and the tooth. It may be very thin, but wherever the periosteum exists, the bone is apt to be present. So in the extraction of teeth, we must take into consideration the liability of forcing the roots through the floor of the antrum. There is danger of fracturing the antrum wall and disturbing the mucous membrane and periosteum which line the antrum cavity.

These considerations should place this work, to a large extent, under the supervision of a surgeon with experience in exodontia.

He is most familiar with the field in which the disease is operating and is particularly equipped to bring about a cure. With the surgical effort of removing the roots and the danger of rupturing the small blood vessels of the mucous membrane and periosteum, added to the infection that is usually present in these roots, a start has been made toward maxillary sinus infection.

This is a condition in which it is wise to remove teeth by the method practiced by Frederick F. Molt of Chicago and Boyd S. Gardner of the Mayo Clinic, in which a flap of the mucosa is laid back and the tissue treated in a definite surgical manner so as to avoid that danger.

The same principle applies in relation to teeth affected by pyorrhea, when the pyorrhea is extensive. The constant biting on such a tooth (or an abscessed tooth of any type) is apt to traumatize the tissues about the apex, because there is sometimes but little bone between the apex and the antrum. Following the trauma, we have the passage of infection to the cavity.

Another type of infection comes as a consequence of infection in the mucous surfaces of the nasal cavity and extends to the antrum as a result of coryza or so-called influenza. The pathology of this type is a little different. The infection is not liable to be the same as that arising from the oral cavity. While the bacteria may make quite a demonstration for a short time, the infection will usually respond after a while to the more simple effort of treatment known as the expectant method, without operation.

In the acute cases not having origin in tooth infection (and sometimes in those that have) operation should not be performed until the acute stage subsides, except to relieve pain or prevent actual necrosis.

Treatment of antrum infection is really a simple procedure, and most of the failures are inexcusable. Barring systemic diseases, there is no type of antrum infection that should not yield

readily to good medical and dental judgment and, when necessary, simple surgery.

The health of the antrum depends to a great extent on the normal drainage and the normal function of the tissue. Just so will the return to normal of a diseased antrum depend on efficient and adequate drainage from the most dependent part of the cavity when surgical aid is indicated.

I have no fault to find with the treatment of antrum infections of nasal origin by nose and throat specialists; but it is hopeless for a nose and throat surgeon to endeavor to establish a cure by drainage through the nasal cavity without considering the possibility of oral cavity infection or the presence of an impacted cuspid or third molar. This is the type of case that will readily yield to proper treatment in the hands of the dental oral surgeon.

In this day of refined surgery, we must treat our patients for this trouble so as to preserve the normal outline of the face, and so that, after a cure has been established, they will not complain of an abnormal sensation in that region.

After an infection, there may be granulations on the mucous surfaces. There may be polypoid proliferations or actual necrosis of the bony walls. If there are polypoid growths, they must be removed. The usual polyp that we find in the antrum is composed of a loose connective tissue elaboration covered with epithelial cells. It is quite a transparent, poorly organized mass of tissue. Polyps sometimes undergo calcification, and I have sometimes wondered whether that is not the type that might be of tuberculous origin, although tuberculosis of the antrum is rare. I have seen polyps the size of a hickory nut that had undergone calcification in a tuberculous patient.

In actual necrosis, an opening will have to be provided for drainage and to remove necrotic bone. The cavity should be opened and drainage established at its most dependent point. It is my belief that the best approach to the antrum is through the canine fossa, enlarging it backward so as to avoid injury to the nasal mucosa on the antrum side of that wall, when the operation is for a type of infection that does not yield to expectant treatment, and the teeth are not involved.

When the teeth are involved, the most successful type of operation consists in removing the infected tooth and enlarging the area from which the tooth has been removed, care being taken to disturb as little as possible the floor of the antrum, because it is in the floor of the antrum that it is difficult to get a closure of the opening in some cases. In fact, it is poor surgery to allow a devitalized tooth to remain under the floor of an antrum that has once been infected. After laying back the periosteum, only enough bone to permit a good examination of the cavity should be removed.

This can be done by exploration with a fairly large and sharp circular curet with a flexible handle, one that can be bent into different shapes, so that the slightest enlargement of tissue can be detected by the sense of touch. If polyps are present, this instrument will detect them, and they can be very readily removed.

If the case is at all doubtful and there is any danger of malignancy, an opening large enough to give an actual view should be made. The history of

the case is the best guide to determine whether it is necessary to do this.

Many cases have not yielded to treatment in the past because of too much surgery. Openings have been made too large and too much of the antrum cavity lining has been removed. The actual curetting of the entire lining of the antrum is a severe measure and should never be done if it can be avoided. It is not a large cavity, and no more of it should be exposed than is necessary to determine the amount and character of pathologic tissue and remove the latter. When we remove the entire mucous membrane and periosteum, while there will be a return of the cavity lining, the tissues will not have the same special features and will not function in so nearly normal a way because the mucous goblet and lymph cells and loose connective tissue will not be reproduced. Nature does not regenerate the highly organized tissues in their original perfect state. The patient will perhaps complain of an abnormal area in the region of the antrum.

The new columnar epithelium will not be so well formed nor function so well as it did. In fact, it is a flat squamous type. The ciliated epithelium is intended to protect the antrum cavity against disturbance from the nasal cavity. The cilia are in constant vibratory motion in the direction of the natural drainage and tend to inhibit the bacteria in their progress from the nasal cavity to the antrum. They aid in the eradication of infection. The mucous goblet cells, by increasing their output, endeavor to put the bacteria in such dilution that nature can cope with the infection.

No attempt should be made at correction when an opening is made into the antrum and the cavity wall is found to be uneven, if the wall is covered with mucous membrane. The opening into the antrum should be carefully made. It is not good practice to take a large surgical chisel and mallet and strike a blow in such a way as to fracture the antrum wall, splitting it beyond the margin of the intended opening. The resulting inflammation will prepare the way for bacterial extension and increase the shock that is present in every surgical interference.

The intra-oral opening is preferable to the so-called major operation which goes through from the oral cavity into the antrum and finally into the nasal cavity, because, when we have made an opening from the oral cavity, the opening in the nasal wall is not necessary; and if we have made an opening into the nasal wall and closed the oral opening, we have increased the surgical area and have not left the patient in a normal condition as far as the nasal cavity is concerned, small mucous goblet and lymph cells being most plentiful in the vicinity of the opening into the nasal cavity. The nasal cavity itself will be unlike the one on the opposite side after the type of operation referred to, because the nasal wall at that point has been destroyed.

Packing of the cavity after operation should be done only for the purpose of preventing hemorrhage in certain cases. Whenever possible, and when the patient can be kept under observation, the pack should be dispensed with, or, if used, should be removed as soon as possible for the reason that it has a retarding effect on the effort the cilia are making to assist these tissues to return to normal.

Frequent irrigation with mild anti-

septics that will not paralyze the cilia is the after-treatment of choice. The columnar epithelium has an absorptive function when acting in a normal way. The epithelial cilia of the antrum point in the direction of the nasal opening and possess the faculty of moving rapidly in that direction, and slowly in the opposite; making an effort to expel mucus or whatever is on the surface of the epithelium. Hence, we see the importance of not disturbing that function in either health or disease.

Whenever malignancy is suspected and the odor and other symptoms are pathognomonic of malignancy, an opening large enough for actual ocular inspection should be made to enable the operator to see the character and location of the lesions in the antrum so that treatment can be administered directly to them. Radium holds out the only treatment worth considering. The actual cautery, when it can be used in conjunction with radium, should not be overlooked.

CONCLUSIONS

1. The consideration of the diseased maxillary sinus resolves itself largely into a study of the mucosa of the cavity.

2. Any operation for the relief of maxillary sinus infection should be one so designed as not to interfere with the mucosa on the antrum side of the nasal wall, because it is in this wall that the special tissues spoken of are most abundant, and, by their destruction, we have made less possible the chance of ever obtaining a normal function of that antrum after the operation.

3. Nature, in the regeneration of the mucous membrane, will not regenerate the ciliated columnar epithelium and other special tissues spoken of in this paper.

4. The opening should be made at the most dependent part, and should not be larger than is necessary to accomplish the result that the diagnosis demands.

5. Malignancy in antrum disease will yield to treatment if it can be detected early, just as in other locations. The cautery in conjunction with radium is essential.

6. The opening, if made in the canine fossa, should be carried posteriorly rather than anteriorly so as not to disturb the nasal mucous membrane.

7. Results in maxillary sinus work can be cleverly handled and simplified by one who has had experience in exodontia.

8. In all cases of exodontia, when the apices of diseased teeth (or normal teeth, for that matter) endanger the floor of the maxillary sinus, the flap operation should be resorted to so that a clear field can be observed.

THE SURGICAL-ORTHOPEDIC CORRECTION OF DEFORMITIES OF THE JAW*

By CHRISTIAN BRUHN, Dusseldorf, Germany

AS war brought many diseases and wounds in the jaws, we were obliged to create several special hospitals, where the dentist could work with the surgeon.

More and more, a new sphere developed in medical and dental science, based on a great number of experiences. Thus, a new way was found to remove the deformities of the lower jaw, especially of the so called macrognathia and micrognathia.

In Figure 1, on the outside, the condition of macrognathia may be observed in the prominence of the chin. It disfigures the face and produces an unharmonious even repulsive expression. The curve of the lower jaw reaches far beyond the upper jaw. In general, there is a more or less large space between the front teeth of both jaws, measured in the horizontal line. If the jaws are closed, the lower incisors cover the upper teeth totally or for the most part. The molars are tilted inward by the unusual bite of the opposing teeth. Macrognathia is caused for the most part by a natural predisposition or by inheritance. According to Brophy (1917) the chief cause is the fact that the articular ligaments have become loose and allow the lower jaw to move forward.

Meanwhile, the curve of the lower jaw will gradually grow; for the upper jaw can no longer hinder this increase. (Fig. 2.) Thus macrognathia of the lower jaw arises from the time when the permanent central incisors and the first permanent molars erupt, up to the time of puberty. In an advanced grade of macrognathia, orthopedic means will not be sufficient. Here, only surgical *and* orthopedic treatment can succeed.

In every surgical treatment known in literature, the operator cuts through the inferior maxillary bone and fixes the parts afterwards. The choice of the cutting line is very important for the healing. (Fig. 3.) When traumatic disturbances of movement appear, the ascending ramus is cut between the mandibular foramen and the incisura semilunaris, because it is not necessary here to open the oral cavity. Therefore, the same place was chosen to correct the macrognathia. The cutting of the mandibular nerve and of the

*From the West German Clinic on Maxillofacial Surgery.

*Read before the Section on Maxillofacial Surgery and Surgical Prosthesis at the Seventh International Dental Congress, Philadelphia, Pa., Aug. 26, 1926.

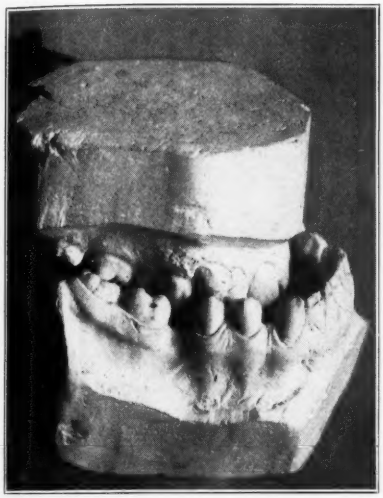

Fig. 1.—Cast showing macrognathia.

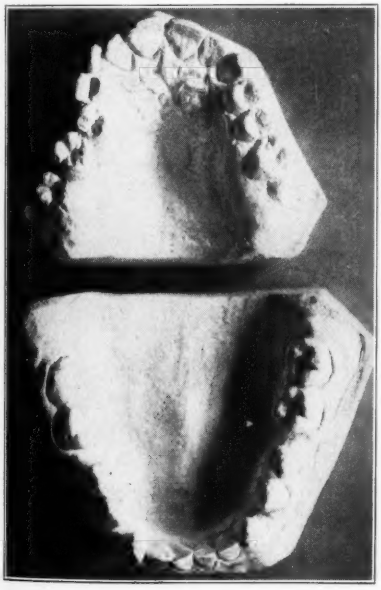

Fig. 2.—Casts showing difference in size of the two jaws.

inferior alveolar artery is avoided, while injury to the facial nerve is awarded by cautiously cutting from the

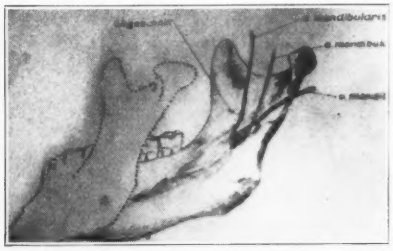

Fig. 3.—Suggested cutting line.

lower back side to the upper front side. We advance from the ear lap to the maxillary bone, cutting behind the parotid gland. The maxillary bone is denuded near the periosteum and sawed through obliquely between the incisura and the beginning of the mandibular canal. The cutting line gives us, in general, nearly a rectangle to the axis of the condyloid process, and it cuts the

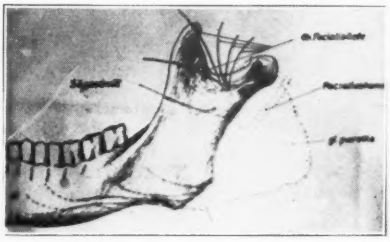

Fig. 4.—Cutting line near condyloid process.

inner and outer flap of the ascending ramus in the same elevation. (Fig. 4.)

Figure 5 shows a man, aged about 22, with macrognathia. There is a striking development of the lower part

Fig. 5.—A case of macrognathia.

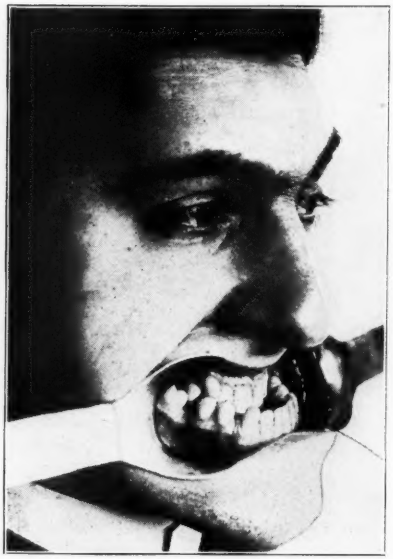

Fig. 6.—Appearance of teeth of patient shown in Figure 5.

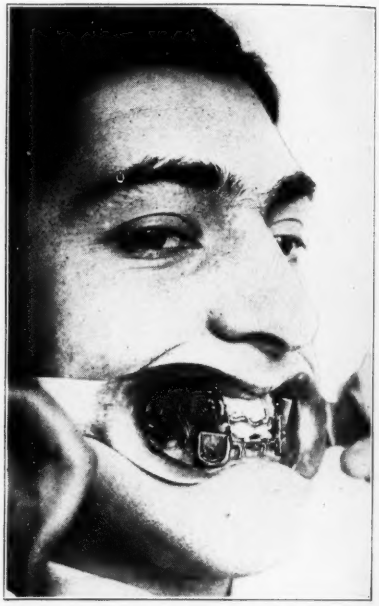

Fig. 7.—Application of wire ligatures to correct condition shown in Figures 5 and 6.

of his face. The prominent chin appears very sharp, and the under lip pro-

Fig. 8.—Cutting line of ascending ramus; fixation of lower jaw by slides.

trudes farther than the upper lip. Since his sixth year, the lower jaw of

the patient had increased rapidly in size. Besides the disfiguring of the face, there was a disturbance in speaking.

Inspection of the mouth reveals a strong and well preserved set of teeth. The lower jaw is abnormally developed. The teeth of the upper jaw are close together. In the lower jaw, there are

Fig. 9.—Teeth in fair articulation.

teeth missing. The extraction of the first molar left a gap between the second bicuspid and second molar. Between the cuspid and the first bicuspid, there is also a space on both sides. The front teeth of the lower jaw protrude about one finger's breadth in front of the upper front teeth. (Fig. 6.)

In the upper and lower jaw, slides were made, to hold the lower jaw in the normal position as regards the upper jaw, in order to correct the deformity. Under anesthesia, the ascending ramus

Fig. 10.—Improved profile of patient.

Fig. 11.—Underdevelopment of jaw (micrognathia).

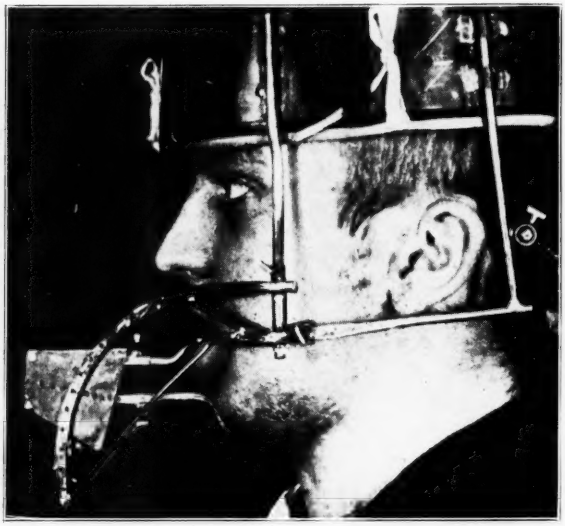

Fig. 12.—Extension apparatus in situ.

was sawed through subperiosteally, a small nearly horizontal cut being made from the ear-lap. We succeeded in reducing the lower jaw so that nearly normal articulation was achieved. Both jaws were strung together by ligatures. (Fig. 7.)

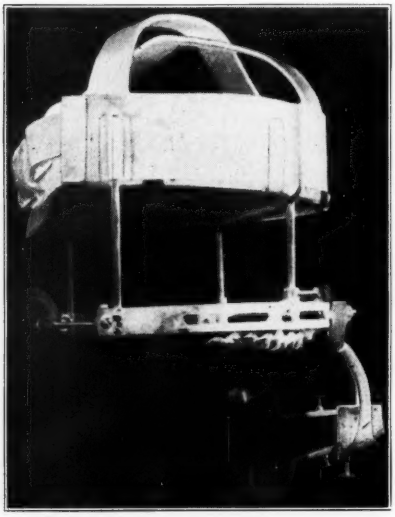

Fig. 13.—Extension apparatus.

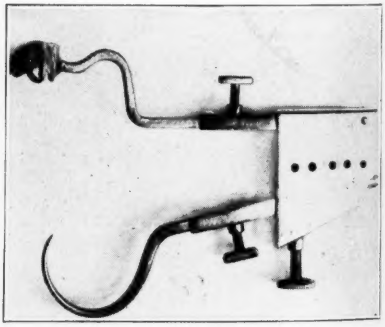

Fig. 14.—Extension forceps.

Figure 8 shows the cutting line of the ascending ramus, as well as the fixation of the lower jaw by slides, which

were fastened to the molars by anchor bands.

After three weeks, the patient was dismissed.

Fig. 15.—Central portion of jaw brought forward by hook and forceps and held in position by extension apparatus.

Three weeks later, the slides were removed. The opening of the mouth was normal and the patient was able to chew without difficulty. The teeth were in moderate (Fig. 9) articulation.

Figure 10 shows the result in profile. The difference before and after treatment is remarkable. Now the finer correction of the teeth could be made,

Fig. 16.—Implantation of bone.

especially the stretching of the upper jaw, to insure correct articulation.

Fig. 17.—Results of treatment.

Figure 11 shows under-development of the lower jaw, called micrognathia. We know a congenital micrognathia of the lower jaw as compared with a micro-

Fig. 18.—Case of widely opened bite.

gnathia developing during the period of growth. As regards the latter, there are for the most part, early disturbances of a traumatic or inflammatory nature, in the region of the maxillary joints, which cause arrest of growth of the lower jaw. To correct micrognathia of the lower jaw, the horizontal ramus must be cut through on both sides.

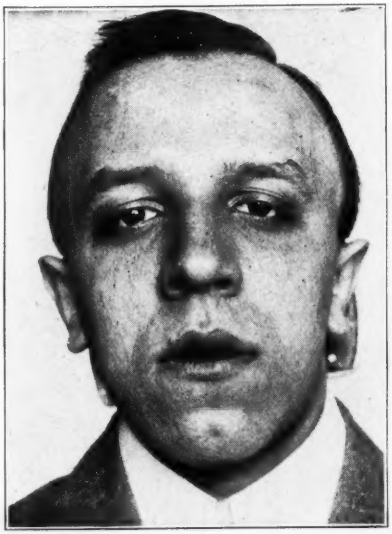

Fig. 19.—Patient having widely opened bite.

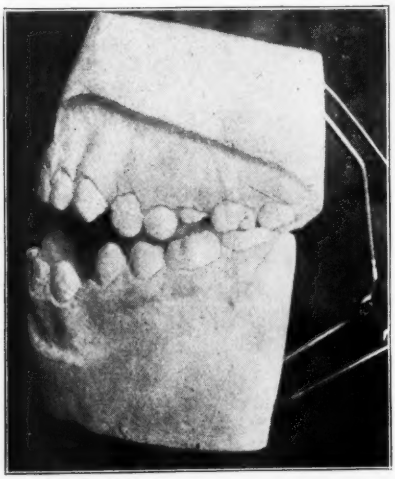

Fig. 20.—Cast showing widely opened bite.

Fig. 21.—Cast showing operation on lower jaw to improve occlusion in case illustrated in Figures 18-25.

Figure 12 shows Bruhn's extension apparatus *in situ*. It consists of a head bandage with a curved double splint (Fig. 13) on which Bruhn's extension forceps are arranged. By applying a cap bandage on the teeth of the upper jaw, the position of the extension apparatus is better fixed.

Bruhn's extension forceps consist of

two blades. (Fig. 14.) The first has a hook, the tip of which grips far back. The second blade is so curved that it can enter the mouth above the under lip. This blade has on its end a cap, fitted for the teeth of the middle piece of the lower jaw. The blades of the hook and of the cap are in shells, where

Fig. 22.—Apparatus in place.

they can be removed in any length. These shells are so combined by a joint that they can be clapped up and down. Thus, hook and cap can be approached. They are fixed by an adjusting screw. A small flat metallic chest, which is put over the shells, prevents each movement of the arms to the sides. The union of the head bandage with the forceps is made by a tag, which is put through one of the holes of the small metallic chest.

In one case, the horizontal ramus of the lower jaw was cut through, between the first bicuspid and the first molar. After anesthesia, we advanced through a small cut from the edge of the lower jaw. We endeavored to prevent injury of the oral mucous membrane, but it cannot be totally avoided. The cutting place was stretched over on both sides; then, the extension hook was placed near the mental spine, the cap of

Fig. 23.—Profile view showing apparatus in place.

the upper forceps blade was fixed on the teeth and the forceps were closed.

The central portion is drawn forward and fastened in this position by Bruhn's extension apparatus. (Fig. 15.)

Four weeks later, the wounds in the mouth were totally cured, so that, on both sides of the incision, a one inch fragment of bone from the crest of ilium could be implanted (Fig. 16.)

Figure 17 shows the result after treatment and after the removal of the extension apparatus.

Figures 18-25 show a case of widely

opened bite. Masticatory movements, speech and the physiognomy are greatly altered by this maxillary anomaly or by the impossibility of closing the lips. The relation of the jaws and of the set of the teeth are shown in the plaster model. The upper jaw ascends very little in its curve and the lower jaw in front is sharply curved downward. As in the picture of macrognathia, the first bicuspid and the cuspid in the lower jaw are far apart. When the bite is closed, only the second molars touch each other, while in front the teeth retire more and more. The largest space is about one inch in the median line. This deformation is probably caused by an irregular growth of the skeleton due to rickets. A second cause, or rather an accompanying symptom, is mouth-breathing, chronic pharyngitis, tonsillitis and often the presence of adenoidal tissue.

Figure 21 shows in the plaster-model the correction by excision of a cuneiform piece on both sides of the lower jaw.

The loose central portion of the lower jaw was seized by Bruhn's extension-forceps and fixed in the proper position. (Fig. 22.)

Fig. 24.—Appearance of patient after treatment.

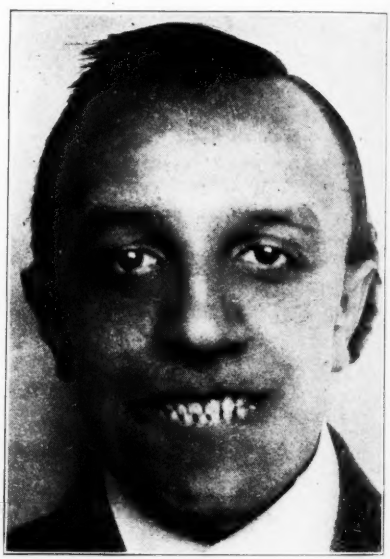

Fig. 25.—Improvement in occlusion after treatment.

Figure 23 gives the profile view of Bruhn's extension apparatus.

In Figure 24, normal lip-closing after treatment is shown.

Figure 25 shows the nearly correct articulation, which was perfected later on by orthodontic treatment.

The above mentioned methods to correct prognathism and open-bite were used in fourteen cases. Macrognathia was present in eleven. We had, in all cases, complete success.

COMPARISON OF BONE STRUCTURE UNDER MOVEABLE AND NONMOVEABLE RESTORATIONS*

By S. M. WEAVER, D.D.S., Cleveland, Ohio

FOR many years, we have read articles and listened to papers on how to build certain types of bridge restorations, but little has been written on the foundation upon which these restorations were to be built.

If any degree of success is to be hoped for in these different types of restorations, it is imperative that this foundation of underlying bone and soft tissues be maintained in as healthy condition as possible.

It will therefore be necessary to study these underlying structures to determine, first, the architectural arrangement of bone, and secondly, the physiologic changes after extraction; also, the blood supply.

Quoting Hugh W. MacMillan of Cincinnati: "The alveolar process may be defined as that part of the jaw bone which gives support to the teeth, or their artificial substitutes, and is composed of compact and cancellous tissue arranged in its external contour and internal architecture to best meet the stresses transmitted during mastication."

It has long been observed that the bone around teeth supporting bridges is characterized by closer cancellations. Increased density and closer spacing of the trabeculae of the alveolar process can also be shown under partial plates and full denture restorations. These changes are rarely produced by infection or inflammation. They are fundamentally changes in bone due to physiologic stimulation. The term "condensing osteitis," as sometimes used, is misleading. These are physiologic changes in bone, not pathologic.

Koch states that "Cancellous bone is found in those parts of the body where the chief function is to transmit tensile and compressive strains."

A single remaining molar that has been called on to bear all the stresses of mastication generally shows an increasing "closeness of spacing" of the trabeculae, and this physiologic transition from cancellous to compact bone around individual teeth is a beautiful picture of bone response to the changing types of stress to which each part is subjected. This bears out Koch's theory that "the thickness and closeness of spacing" of trabeculae vary in bone directly with the intensity of the stresses transmitted by them. This will account for the varying density of most of the radiograms.

It will also be noted that there is a decreased closeness in the spacing of the trabeculae around teeth not in use.

The alveolar plates contain all the characteristics of compact bone found

*Read before the Section on Partial Denture Prosthesis at the Seventh International Dental Congress, Philadelphia, Pa., Aug. 26, 1926.

elsewhere. Histologically, it is the same except for the arrangement of the lamellae, due to its particular development.

A histologic study of the cancellous tissue in cross-section through healed molar alveoli reveals the presence of compact bone at the gingival border uniting the inner and outer alveolar plates. This change from cancellous to compact bone in this region is an example of what goes on when proper stress is brought to bear over the alveolar ridge.

The cortical plate being the foundation upon which our success depends, the question arises as to how to maintain and regenerate a proper cortical plate that will withstand the greatest stress and give the patient permanence and the greatest comfort.

Noyes describes the cortical plate as varying in thickness, the variation depending on the stress to be sustained. The direction and arrangement of the plates of cancellous bone are continually changed and rebuilt to adjust them to the support of new conditions.

The next thought is, how are we to hasten this cortical plate regeneration where surgical interference is necessary? The alveolar process has a definite function after the loss of the teeth, and responds physiologically to the stimulation of artificial restoration, and by this stimulating intermittent pressure, the tissues are kept healthy.

A close study of the bone by intraoral radiography raises the following questions:

1. How much of the existing alveolar process remains after the teeth are extracted?

2. How much trimming of the alveolar process should be done, if any?

3. How long should the case go before the restoration is placed?

4. Is it of benefit to call on this tissue to withstand the force of mastication early?

5. Is intermittent pressure beneficial to the forming and maintaining of the cortical plate, or is it more desirable to so construct the restoration that all stimulating effect of mastication is destroyed?

ANSWERS TO QUESTIONS RAISED

1 and 2. The amount of normal alveolar process which should be retained and regenerated to form support for the restoration depends on what the oral surgeon predetermines is necessary. A careful diagnosis as to the requirements of each case should be made in consultation with the operator who is to make the restoration.

Ordinarily, this should consist of the removal of spicular prominences only, and the reduction of buccal and lingual plates where undercuts can be predetermined, the buccal and lingual flaps afterwards being drawn gently together with proper sutures, care being taken never to suture too tightly. Proper suturing greatly facilitates early repair, practically eliminates after-pain and admits of a much earlier restoration.

3. The length of time before a restoration is placed depends always on the condition of the tissues as regards soreness on digital pressure. In my opinion, the quicker this tissue is called on to do work, the faster the bone tissue will be deposited; but it is never advisable until sockets are healed over, this avoiding forcing infection into the bone structure. In most cases, from five to ten days should elapse before impressions should be taken. Earlier than this, the patient will be unable to withstand the

force of mastication with any degree of comfort.

4. I am convinced, from my own clinical observations, that the sooner the proper stimulating pressure can be brought to bear on the newly forming alveolar process, the more quickly the cortical plate with its new supporting structure will be laid down, and the less absorption will occur.

5. Are intermittent tissue bearing restorations more beneficial to forming and maintaining the cortical plate and underlying soft tissues than nonstimulating and nontissue bearing restorations? There has been considerable written about diet and bone salt metabolism to furnish the proper bone forming materials, in order to hasten the building of the cortical plate and its supporting structure, but I consider it impracticable to try to get results in the short time between extraction and the replacement of most restorations.

My preference would be to bring the bone-forming salts already existing in the blood stream to the crest of the alveolar ridge by proper artificial stimulation, causing them to be laid down where Nature so wisely chooses, in its supporting architectural arrangement of the trabeculae, to resist stress.

We must keep in mind that this region has lost its previous power of intermittent stimulation of the blood supply caused by the pressure of mastication on the resilient tooth sockets, and it is only natural to try to substitute this lost function as efficiently as possible. Fortunately, most patients demand a restoration as soon as possible, either for esthetics or for mastication.

Therefore, the only means of substituting this lost function is a restoration supplying the lost intermittant pressure as closely as is possible by mechanical skill.

Moveable removeable bridgework, partial plates and full dentures come under the class of stimulating restorations, while all types of fixed bridges should be classed as nonstimulating. The greatest factor in producing atrophy and resorption of the alveolar ridges is disuse.

I would like to define what constitutes proper stimulating pressure. First, it must be a pressure so applied that it does not interfere with the normal blood supply. Second, it must be intermittent, not constant; otherwise it will inhibit the blood stream and cause atrophy of the underlying structure.

All removable restorations should be both tissue and tooth bearing, allowing the tissue bearing surface to carry as much of the load as is possible under mastication. The abutments should act more as stabilizers, carrying as little stress as possible. The proportion of stress carried by each is determined by the operator in his skill in saddle design and equalization of the masticating forces.

Small replacements, such as lateral incisors and some bicuspids, can be safely made of the stationary type, provided they are of the loose end rest type. The bone area under this type is maintained by the stimulation of the closely adjacent teeth.

Porcelain root end pontics pressing or inserted into the tissue should be thoroughly condemned. This causes strangulation of the blood supply and atrophy of the cortical plate, or an abnormal retraction. It is seldom that we see normal alveolar repair under this class of restoration. It may be permitted to approximate the soft tissue,

but never to cause pressure of the underlying bone structure. This, like all stationary bridgework, does not permit the stimulating effect of mastication to act on that part of the alveolar process that has been deprived of the natural teeth whereby it received its constant stimulation of the blood stream.

This is more evident in the molar and bicuspid region on account of the greater width buccolingually of the protecting restoration.

In writing this paper, I have tried to deal with the principles of ideal restorations and not with any mechanical procedure.

In constructing these restorations, I use practically one class of attachments; this, because it has been systematized; is interchangeable, and has a sufficient variety of sizes to be adaptable to any and all classes of cases. Unfortunately, we have no other attachment that has these qualifications but Dr. Chayes'.

In summing up the advantages of moveable-removable restorations over all other classes, we claim superiority in: (1) sanitation; (2) amenability to tissues; (3) proper stimulation of underlying tissues; (4) permitting functional activity of tissues; (5) lessened liability to recurrence of decay around abutments; (6) ease of access, if decay occurs; (7) ease of repair; (8) restoration of lost anatomy both lingual and buccal; (9) partial relief of strain of mastication on abutments; (10) allowing abutments to function as Nature intended; (11) ease of adjustment where settling or intrusion of the abutments cause too much pressure on the soft tissue, an almost impossible condition to adjust with fixed bridges.

DISCUSSION

Hugh W. MacMillan, Cincinnati, Ohio: The recognition of the fact that the alveolar process is true bone and reacts to the various degrees and directions of stress to which it is subjected is the chief contribution which Dr. Weaver has made in this most excellent presentation. In the comparative examination of alveolar process with the remainder of the osseous system, histologists have found similarities in structure and development, and in the anatomic mechanisms involved, but to be of practical value, these findings must be put to the test of clinical experience. The appliances described by Dr. Weaver seem to meet theoretically the conditions necessary to stimulate bone physiologically. Their long life, sanitary features, thermal conductivity, movability and the condition of the alveolar ridge on which they function prove, in a practical way, that they have met as satisfactorily the clinical requirements. The histologic characteristics of the bone rebuilding the alveolar process after extraction resemble those concerned in the repair of fractures of bones which are under similar types of stress. Thus, the compact type of bone forming the periphery of the alveolar border is in accordance with the law of bending stress which, in order to secure the greatest strength, requires the arrangement of bone to be at the greatest distance from the neutral axis. Comprehensive stresses produced by properly constructed appliances also determine the contour of the peripheral border. The latter condition is more nicely illustrated in the maxilla where the bending stresses are not so apparent. The histologic appearance of the supporting trabeculae of the alveolar border would convince the most skeptical observer of the adaptability of the alveolar process to its environment. The presence of several haversian systems in a single trabeculae indicates the very definite function possessed by these supporting beams. The callosities of the mucosa, the increased closeness of spacing of the alveolar border, the flat base and parallel borders of the beautifully contoured ridge under properly constructed appliances, compared with the changes produced by disuse atrophy and misdirected surgery, convince the bioprosthetist of the advantages of rational surgery and physiologic appliances. Dr. Weaver's paper is unique in being the first one, so far as I am aware, to describe the

construction of restorative appliances strictly in accordance with the histologic findings of the foundation on which they rest. Its greatest value to the prosthetist is that the scientific technic which he has outlined has met with clinical success.

Howard H. Jackson, Detroit, Mich.: The paper which Dr. Weaver has presented illustrates the importance of close observation of correctly exposed radiograms, made in sequence, of individual cases from a period preceding removal of the teeth to a time when the effects of different types of restorations can be correctly determined. Dr. Weaver is to be congratulated in presenting his paper, not only because of the importance of the subject but also because of the thoroughness with which he has covered it from the standpoint of the results that will follow in the use of the two types of restorations in healthy patients. Unfortunately, these same favorable results, which are so greatly desired not only by ourselves but also by our patients, are not always obtained. These failures, or cases not entirely satisfactory in their final analysis, cannot always be blamed on lack of technical ability or understanding of the principles involved. Instead, they are the result of a faulty foundation for the restoration. The foundations for successful removable or fixed restorations are not merely the teeth alone but also the supporting structures of the teeth; that is, the alveolar process and the bony structures in general. In the final analysis, the systemic condition of the patient as far as it affects the bone-salt content of the bony structures, is a decisive factor, as is also unresisted infection involving the cortical layers and their supporting cancellous structures. We can thus divide the underlying factors of favorable and unfavorable ridge-forms, which are the real foundation of removable pieces, into two main divisions, local and general, or systemic. The general factors govern the bone-salt formation throughout the entire skeletal frame, and, as such, must influence the cancellations of the alveolar process as well as the other bones. Systemic conditions resulting in loss of density of the cancellations will produce an unfavorable condition for removable pieces, and from observation, conditions such as this do not readily produce a condensation of cancellations about an isolated tooth unless condensation has preceded the atrophic state. In the normal individual, such an increase in number and size will occur, but in the disturbed bone-salt metabolism above mentioned, it may not occur. The local factors tending to interfere with desired stability of tissue adaptation are retained infectious conditions within the cancellations and cortical layer which interfere with regenerative processes. This sometimes results in an area of localized irritation beneath a removable piece, and again it produces a constant and annoying shrinkage of the ridge-form which requires frequent rebasing of the saddle. These factors in a person of lowered resistance are not readily overcome without proper surgical interference, after which more stable conditions are found. We are mentioning these conditions as factors which must be considered in removable restorations if success is to be expected. Recognition of these factors can be determined only by means of a radiogram which has been correctly exposed, developed and examined under favorable illumination. There should be as much emphasis placed on the different phases of radiographic technic and interpretation as is placed on the technic of cavity preparation and correct application of mechanical principles in the construction of the removable piece.

OFFICE ORGANIZATION*

By JOSEPH D. EBY, D.D.S., New York City

MEN in all branches of the healing art are, after the completion of their education and training, and on entrance into practice, confronted by many of the same problems.

There is quite a variance in the attitude of different men as to the course which they should pursue at this stage of their careers. Practically every one can look back over this period and discern clearly wherein these early steps affected, in great measure, his future. The first years of practice do not determine the ultimate status of any individual, and the lives of most men who have attained success show radical moves at points where they have risen to meet the opportunities which experience or ambition have opened before them.

Orthodontia, particularly that of the future, is as exacting as any branch of the healing art; for, behind the high degrees of mechanical training, there is a fundamental scientific background. The formula of success is intricate, but, like all things, it may be analyzed and defined. Perhaps the most stimulating thing which any young orthodontist can do is to make an intimate study of the lives and habits of older men who have achieved success, and have placed our specialty where it is today. It will be found, without exception, that these men possess, first, proper training, through which they have gained a vision or insight into what orthodontia really embraces. It will also be found that all of them possess a degree of energy and the will to overcome all obstacles.

No truth has been better expressed than in the quotation, "If anyone can make a better mousetrap than his neighbor the world will make a beaten path to his door."

It is safe to say that the best orthodontist who ever lived cannot possibly excel unless surrounded by proper equipment, and to a large extent he is dependent on the office organization and facilities with which he is surrounded. The basic thought in every office should be, what is the best system of treatment, considering economy of time, effort and expense?

Few young orthodontists realize what should be done to prepare and keep proper clinical and business records. It is not a difficult matter to prepare an inventory of the contents of an office. With this, it is possible to estimate operating costs on the investment, and by adding the cost of operation, including employment, depreciation and

*Read before the Section on Orthodontia at the Seventh International Dental Congress, Philadelphia, Pa., Aug. 24, 1926.

materials, any one who has the desire can readily estimate costs computed as an average either by the hour, day, week or month. With this knowledge in hand, it is not difficult to evaluate in terms of time and skill the minimum-maximum range of fees which are equitable as a fair exchange for service rendered and value received.

When an orthodontist's practice reaches proportions to justify the cost, his first need is a secretary. In the beginning, she may be of assistance at the chair; but an assistant with a knowledge of bookkeeping, shorthand and general office management is preferable to one with training as an assistant at the chair, if one or the other is to be employed alone. The next extension to meet advancing needs is the employment of a woman assistant to be trained for laboratory work in the preparation of casts, and for some appliance technic, as well as the routine which pertains to the treatment of patients.

Every orthodontist should have two chairs, as soon as possible, preferably in separate rooms; for it will be found that in this way he can expedite his work, increase its volume, and give better satisfaction to patients. A single orthodontist in an office of this nature has not yet reached the finest state of organization. In every large practice, there should be an associate or assistant, so that at least one competent person is present at all times to meet emergencies.

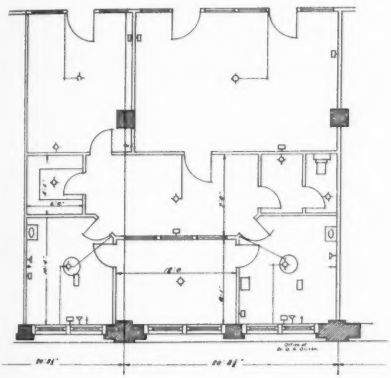

Fig. 1.—Floor plan which places the laboratory between the two operating rooms.

Fig. 2.—Laboratory of office the plan of which is shown in Figure 1.

Through the kindness of a few of our friends, who are all busily engaged with large practices, I have been enabled to prepare a number of illustrations showing office plans which, in their experiences, have proved most efficient.

Figures 1 and 2 are taken from the office of Dr. Oren A. Oliver. Figure 1 shows a floor plan of the office which presents several ideal features. The principal feature is the position of the laboratory between the two operating rooms. At the ends of the hall are the

women's dressing room, lavatory and store room. The private business office affords a splendid arrangement for conferences and the transaction of business.

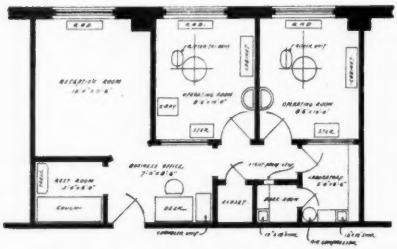

Fig. 3.—Convenient design of office (with two operating rooms), covering 467 square feet of space.

Figure 2 shows the laboratory. The benches are American Cabinet Company units, systematically organized in a way which makes it possible to produce great volumes of work.

It is surprising how the necessary facilities for an orthodontist can be

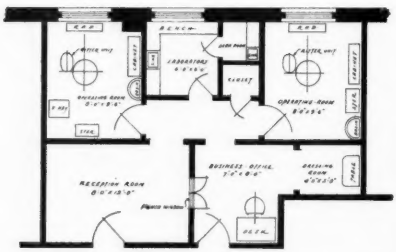

Fig. 4.—General plan suggested for 432 square feet of space.

placed in a small number of square feet if studiously arranged. Figure 3 suggests a convenient design of office containing two operating rooms and other necessary arrangements in 467 square feet. This plan, in a sense, would be almost as convenient as having the laboratory between the two operating

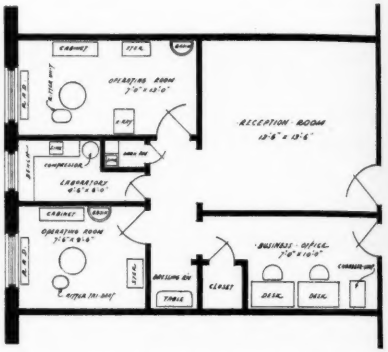

Fig. 5.—Same plan as shown in Figure 4, but occupying slightly more space (540 square feet).

rooms, and would be an ideal one-man office.

Figure 4 shows the general scheme recommended in 432 square feet.

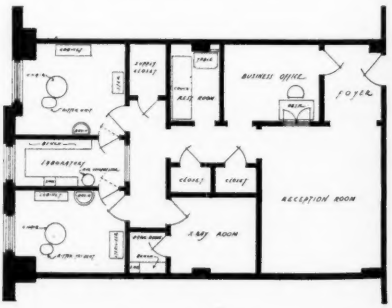

Fig. 6.—Office occupying 763½ square feet. There are a roentgen-ray room, laboratory, two operating rooms, dark room, restroom and adequate storage space, in addition to foyer, reception room and business office.

Figure 5 carries out the same general scheme in a slightly larger office of 540

square feet, with many attractive features.

Figure 6 approaches, in the larger area of 763½ square feet, many advantages. In addition to the general scheme, between the laboratory and operating rooms it provides a roentgen-ray room which may also be used as a a treatment room, a dark-room, a rest room and lavatory, as well as adequate storage space. This arrangement is the most satisfactory that I have been able to find for the specified area.

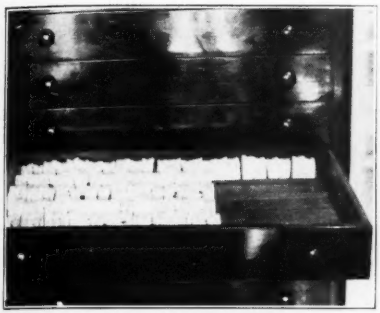

Fig. 7.—Cabinet drawer for models.

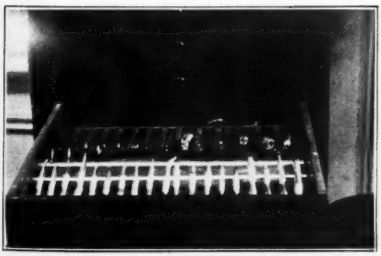

Fig. 8.—Ideal pliers drawer.

It is wise for every orthodontist considering the establishment of an office to seek the services of a specialist trained in dental office architecture and place the immediate problems before him.

The office of Dr. John V. Mershon, offers some delightful suggestions for comfort and ease of operation, with a minimum of expended effort and energy. This office is situated in a private apartment, which offers the relaxing environment of a homelike atmosphere and has a good psychologic effect on children. The secret of the advantageous arrangement of this office also lies in the location of the laboratory between the two operating rooms.

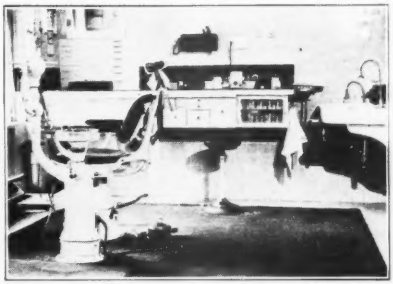

Fig. 9.—Ideal equipment for orthodontist.

Fig. 10.—Systematic plan of office organization.

Figure 7 shows a cabinet drawer in Dr. Mershon's office with a few models removed to show the partitions which keep them in alinement.

Figure 8 was taken in the office of Dr. J. Lowe Young. His office occupies an entire floor in a large residence in a section which is free from the crush and turmoil of traffic, and offers an atmosphere and environment most acceptable to children, at the same time replete in design and equipment which makes for comfort and efficiency.

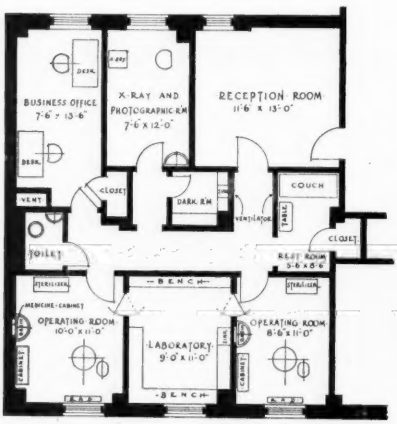

Fig. 11.—Plan calling for 913 square feet of space (author's office plan).

A good suggestion is to be gathered from this office from the manner in which the drawers of the operating cabinets are subdivided for various uses.

Figure 8 shows an ideal design for a pliers drawer. The tips of the pliers project for ready handling and the white celluloid strips bear the numbers. It would be impossible to improve on this design.

Figure 9, taken in the office of Dr. Charles A. Spahn, shows a plan of equipment which, I believe, would be regarded as ideal by the great majority of orthodontists. It will be noted that this room is lined with tile and that everything is either built in or against the walls, so that spotless cleanliness is easily maintained. The drawers and surfaces of the cabinet are classified and organized for different phases of work, everything being readily accessible. This picture is submitted for your careful study of its complete and immaculate appointments and fine detail.

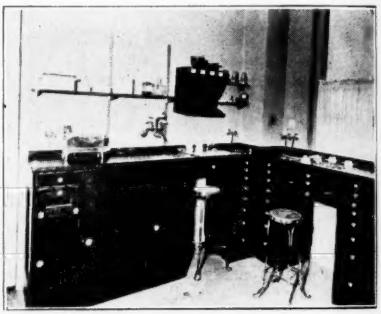

Fig. 12.—Laboratory in author's office.

Figure 10, from the office of Dr. B. E. Lischer, shows a most systematic plan of organization. In the far right-hand corner will be seen a cabinet for general utility purposes. In the foreground will be seen a glass case in which are kept expendable materials and instruments less frequently required in use. It is clear, from the equipment and arrangement of the operating rooms, as well as from seeing Dr. Lischer at his work, that a splendid plan and established method of asepsis is pursued.

Under no circumstances should an orthodontist locate his offices in a section of the city heavily congested with

traffic. Children and parents are entitled to as much consideration and safety from this point of view as possible. It is often desirable to utilize a residence, apartment or cooperative building, either one of which will relive him from the responsibilities and uncertainties of an office rented on a term lease. Owning one's office and not having the uncertainties of a lease to contend with makes it possible to install many stationary conveniences for

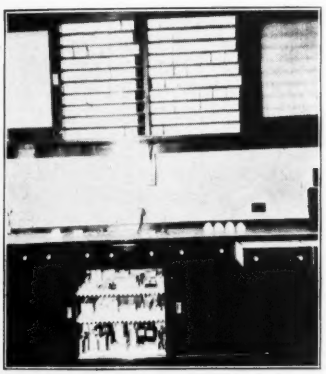

Fig. 13.—Section of rear wall, showing boxes for storage of casts, drawers for appliances and shelves for expendable materials and miscellaneous supplies (author's office).

efficiency and comfort which would otherwise be out of the question.

Figures 11, 12 and 13, taken in my own office, represent the practical application of many suggestions which have been garnered from my friends and are in line with the various illustrations shown herewith.

The floor plan in Figure 11 covers an area of 913 square feet. The general plan is laid around the two operating rooms with the laboratory between, connected with swinging doors. The reception room accommodates ten people comfortably, and the relation which the women's dressing room bears to it relieves congestion. The combination roentgen-ray and photographic room may be utilized for treatments. This room also contains height and weight scales, as well as books and articles on child welfare of interest to parents. The private business office is invaluable for consultations and conferences, as well as for routine business.

Figure 12 illustrates the left and part of the front sides of the laboratory. These benches were planned and built in to fit the allotted space. At the left, there will be seen a trap door compartment for soiled linen. The second doors opens to a refrigator, which is very convenient during the warm months for chilling developing solutions, etc. Next comes the basin and a plaster bench. Above, on a glass shelf, are receptacles for sterilizing drinking glasses and such instruments as do not require boiling.

Figure 13 shows a section of the rear wall. Above will be seen a section devoted to the storage of casts in individual boxes, each box having a capacity for four casts. The number of the case appears on each box, and in the open drawers below at the right are smaller boxes bearing similar numbers for the filing away of appliances. The surface of this bench is utilized for incoming and outgoing work, and beneath it are compartments with shelves for expendable materials and miscellaneous supplies.

One of the most important things to which I would call your attention is the advantage to be gained in saving steps in the course of a day's routine. If the basin can be placed two steps from the chair instead of six, and if the laboratory is adjacent to the

operating room instead of down the length of the hall, hundreds of miles of walking will be spared and fatigue will be eliminated.

While we will all admit that a splendid office organization is a great aid in a successful practice, many of us are prone to carelessness in our attitude toward the environment that we work in. This may cause actual losses in energy, production and the quality of service. We also find men who are constantly studying over these points and, from time to time, make changes calculated to better their conditions. Of the two types, the man who is alert and always watching these things will travel much farther on the road to success.

DISCUSSION

B. G. DeVries, Minneapolis, Minn.: Dr. Eby deplores the unwillingness of many young men entering the field of orthodontic practice to secure adequate preparation; and later, develops the thought that the lack of foresight and patience in this regard greatly retards their arrival at the point of mature expression of their professional life. This point is well taken. All educational processes are today seeking to arrive at ways and means of so administering preliminary and professional education that the recipient shall be left with a developed ability to take on most quickly the attributes of true professionalism. An eminent member of our profession once stated to me that, in his opinion, no man ever became a professional man in the larger sense until he reached the age of at least 35. What he implied was that, in the case of the average graduate, it required that amount of time before a man began to realize his true relationship to himself, his practice and society. A willingness to develop to the utmost his professional background is one of the surest indications of future success accruing to a man. No one can successfully carry on and develop the highest expression of his profession unless he has a well conceived idea of what it all means. The value and test of any activity is at its operating point. This is where the man, as an agent, expresses to society the value of what he is trying to do. He becomes at once an exponent of that form of endeavor—be it sculpture, painting, plumbing, medicine or orthodontia. Naturally, it follows that facility at the operating point is one of the first requisites of success. You would not expect a painter of portraits to equip elaborately a room devoid of daylight and successfully analyze color composition. Nor can an orthodontist accomplish his best work when hampered by inefficiency in his surroundings. Many times, this impediment to more facile operation is unknown to the operator and, until he analyzes what he is doing and how, it will remain an impediment reflecting on his work. We have seen dental offices which were beautiful boudoirs, splendidly fitted up for a manicurist's establishment but which failed utterly as competent and efficient for the practice of dentistry. True, a man's nature may be whimsical, artistic if you will, and it may be reflected in the tone of his office; but the *sine qua non* of the successful expression of his work will be in his facility and efficiency at his operating point, for this is where he is judged. Orthodontia makes many demands on the conscientious operator, and it follows that the fewer the extraneous harassments, the better his work will be. Nothing in my mind is more disconcerting in an office than the irritation of administrative disorder. It is the orthodontist's function to see that the right food is served and not to wash his professional dishes. Dr. Eby advocates the proper analysis and valuation of all economic factors in the administrative end of office routine and, then, dismissing this from the mind, to devote attention to the development of production and technical advancement which are the companions of success, financial or otherwise. While I am a firm advocate of the theory of relaxation and do not believe in always carrying with us our professional worries, I also am of the opinion that this can be carried too far. Orthodontia differs from almost every other branch of the healing art in that it is a long process requiring constant care at all stages of its administration. Distorted appliances, often imperceptible to the patient, if neglected frequently create conditions of serious consequence. While technically such occurrences may not be attributable to the orthodontist's neglect, it must be remembered that he is the

one to whom the patient looks for the entire supervision and success of the treatment of the particular case. Morally, he is responsible for what may occur in such an instance. For that reason, I concur with the thought that, during an orthodontist's absence from his practice, whether through vacation or sickness or what not, some one competent to meet emergencies should be available in his office. How this situation can best be met is a matter of personal solution, whether through an assistant or associate. In my own office, I employ a woman associate, qualified by her dental degree to administer to my patients, and I find it very satisfactory. When patients realize that some one who is responsible is always available in time of emergency, it eliminates whatever anxiety they might experience when the orthodontist is absent. The depictions of various office plans are extremely interesting and valuable to all of us. The men whose offices Dr. Eby has shown us are all men of outstanding ability and who have adopted certain features in their environment for very definite reasons. We can all profit greatly by their study. Only last week I had the pleasure of going through Dr. J. Lowe Young's office in New York City and I left there with a keen realization that I had witnessed a beautiful example of efficiency. We all can profit much by focusing a more critical eye on the environment in which we spend so great a part of our lives in an endeavor as high in its demands and ideals as the practice of orthodontia.

THE HYGIENE OF THE MOUTH*

By MILDRED W. DICKERSON, D.D.S., Washington, D. C.

HYGIENE means "science of health." Since the science of health of the mouth is so broad a subject, this consideration of it will be limited to that phase which is concerned with promoting mouth health. It includes a discussion of the building of strong and healthy oral tissues, and of their subsequent use and care, with the objective of preventing caries and periodontal disease, and thereby lessening systemic diseases. All good dentistry is recognized as preventive dentistry, and mechanical skill as well as correct diagnosis is of the utmost importance in preventing and checking the ravages of dental disease.

The practical measures at our command for promoting the health, not only of the teeth, but also of the body, come under two heads. The first is educational, consisting in the education of the patient in both oral and general hygiene. The second is operative, consisting of the operations by the dentist.

In a program of education, dentistry should be concerned chiefly with the prevention of disease by the removal of physical defects and by the development and maintenance of a high resistance to invading organisms. Therefore, we must consider the importance of nutrition in the development of sound teeth, as well as sound bodies. During the entire period of the development and eruption of all the teeth, the question of diet should be ever before us. The importance of the minerals as tissue builders, particularly of the bones and teeth, is generally recognized, although there is little of a definite nature in medical literature on this sub-

*Read before the Section on Periodontia at the Seventh International Dental Congress, Philadelphia, Pa., Aug. 26, 1926.

ject. The work of Sherman[1] on calcium indicates that the diet of the American people is more likely to be lacking in calcium than in protein. The food of mothers during pregnancy, of infants and young growing children, particularly, should be high in its calcium content to meet the requirements for increasing amounts of this substance. If normal metabolism is to be maintained, a well-balanced diet is necessary. Proper diet helps not only in the building of strong teeth, but also in the prevention of rickets. Marshall says, "There is no doubt of one fact, namely, that rickets and poor teeth are concomitant conditions."[2]

In 1920, Dr. Fones wrote, "Personally, I believe that in childhood a well balanced diet, with special emphasis on the calcium-content of foods and the elimination of free sugar, would result in practical immunity from dental caries."[3] At the present time, the tendency of the medical profession is decidedly toward the limitation of free sugar in the diets of both sick and well people, and the study of its relation to dental caries is worthy of our careful consideration.

The chemical and the physical properties of food have both been shown to influence the health of the teeth and gingivae. Therefore, these properties are important when the predisposing factors of dental diseases are considered. Soft diets tend to rob the masticatory apparatus of the necessary amount of exercise. Even young children should be given some food that requires considerable mastication. Otherwise, the teeth and their supporting structures suffer from a lack of sufficient use, the result of which is to be found in underdevelopment of the jaws, with a subsequent crowding of the teeth. Malposition leads to a lack of cleanliness owing to the absence of normal function and the difficulty of cleaning the tooth surfaces. For this reason, it is a predisposing factor in dental caries and diseases of the gingivae. In correcting malocclusion, orthodontists stress the importance of function because growth of the jaws is favored by well-directed exercise.

The physical characteristics of food bear a direct relation to caries and periodontal disease. A soft diet promotes disease; whereas, a fibrous one, in addition to its stimulating effect on the process of mastication, serves also, in a decided measure, as a cleansing agent on the surfaces of the teeth. However, function itself is the foundation of all cleanliness and should be so emphasized, regardless of the diet. This fact may be observed even in the mouths of patients who are on prescribed nonfibrous diets. During the act of mastication, the friction of fibrous food, passing over the gingivae, stimulates their circulation and thereby greatly increases their resistance to periodontal disease. The subject of diet, then, is of practical interest and use to the dentist under three heads: 1. Nutrition, as concerned in the building and growth of normal oral tissues as well as healthy bodies. 2. Exercise of the jaws, teeth and gingivae through efficient mastication. 3. The natural cleansing of the teeth in the process of mastication. In all discussion of nutri-

1. Sherman: J. Biol. Chem.

2. Marshall, J. A.: Relation of Diet to the Teeth from the Standpoints of Development and Prophylaxis, J.A.D.A., 10: 387 (May) 1923.

3. Fones, A. C.: Dental Cosmos, 62: 516 (April) 1920.

tion and the proper foods to be eaten, it should be remembered that, in the light of our present knowledge, the only thing food will do for teeth already erupted is to safeguard them by maintaining the health and vital resistance of the body.

Oral prophylaxis is recognized as the most effective measure employed by the dentist in combating caries and periodontal disease. It consists in the thorough cleansing and polishing of the teeth and the stimulation of gingival circulation. Prophylaxis should be given at intervals of not more than six months. Both children and adults should have regular oral prophylaxis and the accompanying regular supervision of the mouth by the dentist. Such treatments should be started early in life—soon after the completion of the primary dentition. As a part of the treatment, the dentist should instruct the patient in the home care of the mouth, making his instructions suitable to the age of the patient. The dentist should see that his patients become better acquainted with their own mouths and thereby give them a greater appreciation of his efforts and the possibilities of mouth health.

More has been written and less is known about dental caries than any other dental disease. Nevertheless, we have the most convincing evidence that the amount of caries can be very materially reduced by a régime of education in nutrition and correct personal care, supplemented by oral prophylaxis. Periodontoclasia has been referred to as the most readily preventable of all dental diseases. This is true, and two of the principal factors involved are cleanliness of all the dental tissues and a healthy circulation in the vascular structures, as brought about through the cooperation of the dentist and the patient.

Cleanliness is a watchword in the prevention of all disease. The lay public has, for the most part, a high regard for this law of sanitation as it concerns the outer parts of their bodies, but they have not been sufficiently impressed with the positive dangers of insanitary conditions in the mouth and the remainder of the alimentary canal. In most cases of periodontoclasia, the records will reveal a history of poor elimination. The improvement in the health of the gingivae which follows a correction of this condition may be demonstrated to the patient.

The dentist should carefully teach a method of mouth brushing that will enable the patient to cleanse the teeth and soft tissues thoroughly and at the same time vigorously stimulate the circulation in the latter. Especial emphasis should be laid on the stimulation of gingival circulation, since a healthy and normal blood supply is the greatest protection against all periodontal disease. Advice as to the type and size of brush to be used is also of great importance. The brush should be small, with the bristles set far apart, so that it may be thoroughly cleaned with hot water. If the bristles are then covered with salt and the brush allowed to dry in the sunlight, if possible, it will be sufficiently sanitary. What seems to us elementary instruction in regard to the choice of a toothbrush, its use and care, is of far-reaching importance to the health of our patients. Any dentist who is indifferent to these details is either ignorant or guilty of neglect. Now and then, a department of health in the public press publishes an article condemning the use of the insanitary toothbrush. Would this happen if patients were more care-

fully instructed in the care of their brushes?

Patients should also be advised to make use of such general hygienic measures as exercise, fresh air, sunlight and regular habits of sleep, rest and eating. An improvement in the general health is manifested in improved mouth conditions.

In the prevention of caries in the mouths of children, it is important that protection of the fissures in newly erupted teeth of the secondary dentition be generally practiced. Orthodontic treatment for the child afflicted with malocclusion is a most necessary measure in preventing periodontoclasia in the adult. Including oral prophylaxis, these three operative procedures constitute the really preventive operations performed by the dentist.

In various localities, the schools, industrial dental infirmaries, departments of public health and other organizations concerned with the health problem of our nation are already accomplishing much toward the education of the public in the subject of oral hygiene. Is the education of the dentist in this important subject progressing even as rapidly? We, as a profession, should take a more active interest in the education of the dentist of the future. A reorganized curriculum for the dental college is the greatest need in the teaching of oral hygiene today. Educate the dentist. The education of his patients will naturally follow. The results will be far-reaching, since that part of the public who receive dental attention are, for the most part, the individuals who mold public opinion. Until the dental students, from the beginning of their course, are sufficiently impressed with the primary importance of oral hygiene and its related subjects, the graduate dentist will continue to place restorative and surgical operations first. Oral hygiene, embracing all steps taken to prevent disease, should be so taught that all procedures in operative dentistry will be performed with the thought of prevention ever in mind.

Henry W. Gillette says, "I await with keenest interest the developments in professional education which I am sure are coming and which I am equally sure are going to enable our profession to justify its existence. . . . I am firmly of the opinion that within the next twenty years the leaders of our profession will hold their position because of their ability to prevent oral disease rather than because of ability to repair damage done by it."[4]

William Osler is responsible for the statement that there is not one single thing in preventive medicine that equals mouth hygiene and the preservation of the teeth.

DISCUSSION

Anna V. Hughes, New York City: The two outstanding features of Dr. Dickerson's paper are, for the reason that they play so important a part in the field of mouth hygiene, education and preventive dentistry; the first to begin prenatally by intelligent care of the mother, the latter involving placing the growing child in the hands of an interested, capable dentist after the child has reached the age of one year. The preschool age is truly the preventive age, and care during this period insures for the child sound teeth with a correspondingly healthy body. Diet is the secret of good health, and a carefully thought out and sufficiently varied dietary should be early prescribed, having always in mind foods for the bone-building tissues as well as muscular development. Exercise of all parts of the body is necessary for their growth and development. This is

4. Gillette, H. W.: Dent. Digest, May, 1926.

particularly true of the jaws with their teeth and surrounding tissues. Nature's method of exercise for the development of the jaws and teeth is mastication. They must be put to work on coarse fibrous foods, hard substances, such as hard bread crusts and apples, which not alone serve as a developer but constitute a cleansing process as well. Soft pappy foods are not to be encouraged but rather those foods which will assure fine bodily tone in a well balanced diet. Oral prophylactic treatments are recognized to be one of the most effective measures now employed in the field of preventive dentistry. Dr. Dickerson states that every six months a thorough prophylaxis should be given. I think every six months with some patients is not often enough. Prophylaxis is a matter of the individual patient and should be recalled by the dentist as often as found to be necessary, every one, two or three months. I am heartily in accord with the statement that these prophylactic treatments should begin with the deciduous dentition and continue throughout life as a health measure. I also agree with Dr. Dickerson with regard to the treatment of fissures and malocclusion. These are indeed important steps toward keeping the permanent set of teeth in a good sound condition. Some of the dental colleges throughout the country, and even a few in foreign countries, have opened schools of oral hygiene for the training of young women in the science of mouth hygiene. These schools are graduating highly trained operators to educate the public in the benefits to be derived from the frequent use of prophylactic measures and the application of these measures in the home care of the mouth. As an educator, the dental hygienist finds her true vocation in educating the public to the great benefits which come from intelligent care of the expectant mother in matters of her own diet and as to how it affects her offspring. In fact, a well balanced dietary plays such an important part in the health and strength of the coming generation that we need such a teacher to specialize in the work and thus spread the gospel of mouth hygiene throughout the country. The young woman who teaches oral hygiene has a psychologic effect on all of those with whom she comes in contact. Her appearance alone spells sanitation, and this, together with a charming personality, a bright, alert, energetic manner, makes her a teacher well equipped to carry on the work of instructing the public in the art of mouth hygiene with its real corner-stone diet. Her mission, therefore, is indeed an important one and she has come to stay. The selection and care of the toothbrush, while it may seem to be a negligible one, is most important. No matter is too trivial to be touched on by teachers of health, especially a matter which plays such a part in our daily exercise for good health, if satisfactory results are to be desired. I should like to mention in passing the importance of brushing the gingival tissues as well as the teeth themselves in order to stimulate circulation. Too often this matter is neglected, with disastrous effects. In closing, I should like to touch on the matter of educating our future dentists in the matter of oral hygiene. The dental college of today, in order to keep abreast with modern methods in the fields of scientific research, requires in its curriculum a course of instruction in oral hygiene and prophylaxis. Indeed, a few of the colleges have already included in their curriculum a thorough course of oral hygiene and prophylaxis and children's dentistry in which the students are required to treat prophylactically patients ranging from 3 to 8 years, including instructions in the home care of the mouth and the filling and extraction of deciduous teeth, special stress being given to the preservation of the temporary teeth until such time as the permanent set is quite ready to erupt as well as the danger of too long retention of the deciduous teeth. Thus, we are well on the way to educating the dentist of tomorrow to insure for the growing child a strong, well-formed set of teeth in adult life as well as a fine healthy body. I believe that dentistry will have then justified itself as a profession as well as an outstanding branch of medical science.

C. B. Fowlkes, New York City: We do not know all that enters into the cause of tooth-decay nor all that produces diseased gum conditions, since there are still factors about which there is disagreement. The suggestions that Dr. Dickerson has offered are the best that we can follow in the light of our present-day knowledge. Dr. Dickerson says, "All good dentistry is preventive dentistry." No one can gainsay that fact. But how much good dentistry does one see? In my twenty-five years of experience, I have seldom seen amalgam fillings properly con-

toured and polished, gold inlays, bridges and partial plates that do not traumatize and produce disease. We may say that it is the fault of the dentist. It it? The average man or woman will pay ten or fifteen dollars for a hat or a pair of shoes, which lasts only a few months, and yet expect the dentist to make an amalgam restoration, for instance, for two or three dollars, maybe one dollar, and expect that to last a lifetime. To the average patient, an amalgam filling is an amalgam filling. He is not educated to know the difference. He wants something quick, easy and cheap, and that is what he gets. What is true of the amalgam filling is true of all classes of dentistry. It is skill and time that the dentist has to sell. When the people are educated to know the difference between good and bad dentistry, they will be willing to pay the fee that such service deserves. No man can practice honest dentistry and compete with the man who does not, until the public are able to discriminate. We shall not know the boon of "checking the ravages of disease by good dentistry," until, as Dr. Dickerson says, we educate the patient in oral hygiene and operative work. What is true of restorative work is also true of prophylactic work. Have you ever observed the prophylactic treatment as given by the average dentist? Does the prophylactic treatment as given by the average dentist prevent disease? No. It takes from four to six hours or more to give a thorough prophylactic treatment in a mouth that has not been well cared for. Even then, it requires the skill of a man who had had special training. Not until the dentist can get a fee commensurate with that he may receive for restorative work will there be prophylactic treatments that will really prevent disease. Not until we have better training for the student in dental colleges will the average dentist be competent to give a scientific prophylactic treatment. Does the average dentist teach his patient to brush his teeth according to the present day methods? No. In the first place, the average dentist does not know how to do it himself. In the second place, it requires time to teach the patient to brush his teeth properly, not to mention the use of the dental floss and checking up home prophylaxis. Did you ever hear of a dentist rendering a bill for such service? His time is what he has to sell. The public must be educated to appreciate and pay for such service. I should like to commend Dr. Dickerson's statement that "The dental students from the beginning of their course should be sufficiently impressed with the primary importance of oral hygiene and its related subjects that they will not place restorative dentistry and surgical operations first." I should also like to endorse the prophesy made by Dr. Gillette, whom Dr. Dickerson quotes: "The leaders of the dental profession will hold their position because of ability to prevent disease rather than ability to repair damage done by it." This is a dream that we hope will come true within the next twenty years, as Dr. Gillette suggests. How shall we educate the public, you ask? To my mind, the public press is one of the best mediums we have today. Some such articles have been appearing, sponsored by local dental societies and health organizations. The truth of preventive dentistry is as important as the truth of prevention in any other disease. What has put over the antituberculosis campaign? Organization and publicity. The press of the country will give space for such articles in preventive dentistry when they understand that a movement of this nature is as unselfish as the antituberculosis campaign. Such education will save not only teeth but also lives.

THE RELATIONSHIP OF HYGIENE TO DENTISTRY*

By ALFRED OWRE, A.B., D.M.D., M.D., C.M., F.A.C.D., New York City

I HAVE been asked to discuss the relationship of hygiene to dentistry. I am tempted to turn it about—to discuss the relationship of dentistry to hygiene; for surely, the latter includes the former. Dentistry, in the last analysis, is only a handmaiden of health. If we view it otherwise, we are in danger of missing the forest because of the trees. And, obviously, so big a subject can be considered in so short a time only in its broadest outlines. I shall make no attempt to treat it in detail. Perhaps this, too, is well; for if there is one fault more than another that we dentists, from the nature of our work, become peculiarly liable to develop, it is that of overemphasizing details—of losing the large in a maze of the small. We need, now and then, to pull ourselves up and look about us and ahead. Such a comprehensive glance about the field of our profession, taken now, shows one clearly defined pathway out of the appalling tropical growth of disease and decay—the pathway of prevention. This fact is a ray of sunlight in an otherwise dark prospect. We are all only too familiar with the hopelessness of trying to keep pace with disease, dental disease especially, through curative measures. We are hopelessly outstripped in such a race. But with the modern emphasis on prevention—with prevention become the keynote of almost every gathering such as this, to consider aspects of health—the situation wears a different face. As Bertrand Russell writes in his latest book, "Education and the Good Life," "If existing knowledge were used and tested methods applied, we could, in a generation, produce a population almost wholly free from disease, malevolence, and stupidity."

This statement is well supplemented by a quotation from another great living English philosopher, Edward Carpenter, in a book published the first year of the Great War:[1]

> Is it not time that a sensible nation should look to it that every one of its members, when adult, should at least be healthy, well-fed, and well-grown, and that each should not only be decently developed in himself or herself, but should be capable of bearing a useful part of some kind in the life of the nation? Is it not time that the nation should place *first of all* on its programme the creation of capable and healthy citizens? Can a nation be really effective, really strong, really secure without this?

And, again, Sir William Osler writes:[2]

> When the thoughtful historian gets far enough away from the nineteenth century to see it as a whole, no single feature will stand

*Read before the Section on Periodontia at the Seventh International Dental Congress, Philadelphia, Pa., Aug. 26, 1926.

1. Carpenter, Edward: Healing of the Nations, p. 157.

2. Osler, William: Evolution of Modern Medicine.

out with greater distinctness than the fulfilment of the prophecy of Descartes that we could be freed from an infinity of maladies both of body and mind if we had sufficient knowledge of their causes and of all the remedies with which Nature has provided us. Sanitation takes its place among the great modern revolutions—political, social, and intellectual.

As long ago as 1885, De Chaumont wrote: "There is not a spot on the globe where a man may not be kept in health and vigor by hygiene."

Recognition of the vital necessity for preventive health measures is not confined to this country. Sir George Newman, chief medical officer of the British Ministry of Health, and of the Board of Education, wrote in his report for 1925:[3]

> It is now eighteen years since Parliament in 1907 established under the Board of Education the national system of the medical inspection of all school children. This system constitutes in my judgment one of the primary foundations of the health of a State and one of the most fruitful applications of Preventive Medicine. For it is the administrative expression of two vital principles; first, it finds out periodically, and in good time, the actual facts of the physique of the individual, and provides skilled health guidance, or treatment of defects or tendencies; and secondly, it draws the attention of the individual to the importance of physical health, and furnishes an opportunity for his education in regard to it. Now if the maintenance of health and the prevention of disease be, as we claim, more essential than attempts, many of them blind attempts, to cure disease, or in other words, if the science and art of Preventive Medicine is more important to the State than Curative Medicine, then these two principles stand out at once in bold relief, as supreme. For consider what they mean. They mean that by the *periodical physical examination of the body* by a competent physician it is possible to treat the beginnings of disease, to correct defects, to reduce morbid tendencies, and to postpone death; they mean that by *education in hygiene* it is possible within limits to control and improve the health and capacity of every individual. I believe that individuals or a nation who are willing to put these two principles, already inculcated in childhood, into practice—i.e., to be medically examined, either periodically or when first indisposed, and accept advice on their health maintenance, and to learn the laws of hygiene—will do more to prolong life, increase its capacity and enhance its value than they would by the adoption of any other single method or procedure yet known to man.

3. Newman, George: Public Education in Health, p. 9.

In this admirable article, Dr. Newman enunciates not only the principle but also its application. We must begin with the young; we must concentrate on the children of the nation if we hope ever to catch up with the specter of disease. How far back this takes us is well known to you. To insure the health of the child, dental or otherwise, we must begin with the expectant mother, and this is only one of the ramifications of our problem. It concerns us as dentists, however, very closely. It has been thoroughly demonstrated of late years that attention to the diet of the expectant mother is the safest means to insure the dental health of the child. A proper diet for the mother, a proper diet through infancy, and childhood, and we insure a normal individual as strongly as possible against dental disease. E. V. McCollum[4] writes:

> We are told by Terman that about fourteen million of the twenty million school children in the United States are handicapped by some kind of physical defect, and that not far from two million are suffering from a grave form of malnutrition. Ten million are said to have enough defective teeth to seriously interfere with health, and as many are infected with tuberculosis, and he estimates that two million will eventually die of this disease. One million are stated to be predisposed to some serious form of nervous dis-

4. McCollum, E. V.: Newer Knowledge of Nutrition.

order. That the conditions are fully as bad as these figures indicate is borne out by the results of medical examination of young men for the draft in the Great War. Why this condition in our boasted favorable climate for civilization, whereas the pastoral tribes of Asia, the nomads of the desert, and the peoples of the Balkan States have no such physical handicaps? It certainly behooves us to seek to discover the cause or causes which are responsible for this condition. Climate has had its opportunity and has not saved us from unenviable physical and health standards. As a result of my experimental observations, I have come to hold the view that animal experimentation, human geography and history, all point in an all but conclusive manner to the diet as the principal cause of our health troubles, in so far as these are not brought about by communicable diseases.

In the booklet[3] already cited, Sir George Newman lists nine groups of ailments which cause illness and death in the Empire. Of these, two groups are definitively listed as being preventable by proper diet. They are digestive disturbance and dental decay. Of the latter, he writes:

Dental Decay is the cause of much ill-health, impairment and invalidity in childhood and in after life, nearly all of it preventable. School medical and dental inspection has revealed the fact that more than half the school children at eight years of age are suffering from caries, and many of them from oral sepsis. In adolescents and adults, this evil continues, producing many terminal conditions—gastro-intestinal trouble, toxaemia, joint affections, neurasthenia—which incapacitate workers to a serious degree. It is now well known that the production of dental caries is largely due to defective feeding of infant and child, the character and arrangement of the teeth, or the absence of dental hygiene. The means of prevention must be directed to these matters. The habitual and thorough cleansing of the teeth the last thing every night, the use of foods which themselves help to keep teeth clean (e.g., vegetables, fruits and any food which needs vigorous mastication), and periodical dental supervision, are certain means of avoiding present and future dental trouble.

As to the effect of diet on the teeth, doubtless many of you have made observations of your own. This phase of the question has naturally interested me greatly; and I am firmly convinced that caries of the teeth and inflammatory diseases about the teeth and gums are largely due to faulty nutrition and other dietetic errors. Furthermore, pus formation occurs more easily when general bodily resistance is lowered; and this is always the case when the diet is faulty.

McCollum, again, has very interesting testimony in this regard. He states:

With the change to a new type of diet, such as is now common in Europe and America, savage peoples and others who have modified their diet in a similar manner, there has resulted rapid deterioration of the teeth and caries has become common. The teeth of the primitive Eskimo were excellent. According to Stefansson, there was no word for toothache in their language. Today the younger generation of the Eskimo dwelling along the Arctic coast of Alaska have teeth as defective as those of children in the States. They have been brought up in a great measure on foods such as are available in the grocery stores in the United States, viz.: on flour, sugar, molasses, muscle meats and fish. . . .

All efforts in this direction (that is, of oral prophylactic measures) deserve the highest commendation, but anyone who gives much thought to this subject, and who is familiar with modern research in the field of nutrition, must come to the conclusion that, valuable as is this movement for the welfare of the children of the present day, it falls lamentably short of being a comprehensive program from the standpoint of the race and the nation. . . . In England and America we are in the stage of progress where repair and cleanliness are goals toward which school authorities and parents are being urged to work. This is essentially an attractive superstructure without a firm foundation. In its present form this movement for the preservation of the nation's teeth is founded upon a plan which will call for more and ever more investment of time, money and human effort with no prospect of relief from the burden.

This is because it ignores the developmental factor. The only logical and far-seeing policy is to inquire into the cause of the poor quality and vulnerability of the present generation, and to take up the task of instituting reforms in our habits of living which will free the next generation from the defects from which we are now suffering.

Present activities in relation to dental prophylaxis may well be likened to the institution of a rigid quarantine in an epidemic of typhoid fever brought about by an infected milk supply, but without making any effort to check the delivery of the dangerous milk. We should not be getting at the root of the evil. *In the prevention of dental caries, the only effective measure is to adopt a policy which will result in the formation of a dental mechanism possessing its own barriers of defense.* This involves the developmental factor, which those now out of infancy no longer have the opportunity to profit by, but we can easily, if we apply the scientific principles of nutrition to the daily life of the nation, leave to our children's children the priceless heritage of freedom from the physical suffering which we ourselves must bear, not only from mouth discomfort, but from rheumatism, heart disease and other ailments having their origin in infected teeth, when dietary reforms are instituted sufficiently effective to bring about this result, and when in addition the dental clinic is established in the public schools on a scale adequate to meet the present day need for repair, we shall have a comprehensive dental program which will in due time accomplish the great objective—the eradication of dental caries. This is, however, but one of a number of most fundamental achievements to be realized by effectively carrying out such a program.

In 1925, Dr. McCollum[5] wrote:

Important as is curative dentistry, preventive dentistry is still more important, just as preventive medicine is of greater value to society than is curative medicine. A few years ago I saw tabulated a list of twenty-four conditions of greater or lesser importance in medicine which may be referred to focal infections. Some of these are very important as factors determining what the health or ill health of the individual will be. Since the teeth are not infrequently the source of focal infections, any measure which we may adopt which gives promise of improving the nation's teeth must be of the greatest importance in the program of preventive medicine. . . .

During the last few years I have given considerable time to lecturing to audiences of dentists in many parts of the country. I have been much pleased with the interest which dentists have manifested in the nutritional problems. I hope that this interest may be extended, and that every dentist may become the advisor of his patients in inducing them to reform their dietary whenever it is of poor quality. If the facts which we now possess could be applied effectively in most of the homes of the land, I venture to predict that a marked improvement could be effected in the quality of the nation's teeth in a single generation. This is the opportunity as well as the duty of the dentists.

Recent testimony to the same effect, with which possibly you are not all familiar, comes to us from Scotland. Sir Leslie Mackenzie, member of the Scottish Board of Health, and crown nominee for Scotland on the General Medical Council, writes:[6]

The point to be emphasized is that the tooth is not an isolated structure, but, at every stage of growth, shares, like other tissues, in the general nutrition. If this be so, the problem of the teeth is only one among the many problems of nutrition and growth. The association of defective teeth with rickets is, therefore, only a special case among others. It would be an immense surprise if a disease like rickets, which affects the whole process of calcium metabolism in the rise of the skeleton, should leave the teeth unaffected. The process of calcification does not differ in its essential nature from one bone to another, but there must be differences in the process of calcification between an epidermal structure (epiblastic) and a bony structure (mesoblastic). Differences doubtless can be shown, but it is difficult to imagine that the process of calcification, however specialized in each special calcifying tissue, stops in one

5. McCollum, E. V.: Preventive Dentistry, Am. Dent. Surgeon, December, 1925.

6. Mackenzie, Leslie: Dent. Mag., November, 1924.

tissue and at the same time proceeds in another.

Further detail on this point I omit, as I wish only to suggest that the question of the resistance of the enamel is not a closed question. If, however, it is finally shown that good diet results in the formation of better milk teeth Professor Mellanby may be justified in saying that "if this be true, the first method employed to reduce the scourge of teeth defect in this country is to improve the formation of children's teeth by better feeding of the mother during pregnancy and lactation, and of the children so long as the teeth are being calcified—that is, for the first eighteen years. Better feeding means the greater consumption of such foodstuffs as promote good teeth formation, and the diminished consumption of foodstuffs antagonizing this development. These experimental results have completely changed the point of view as to the cause of dental defect, for previously all attention has been directed to the action of bacteria and their end products externally on the teeth, and the toothbrush has been the great stand-by. It has proved but a bruised reed." Whether we accept this conclusion or not, the recent investigations constitute a challenge that cannot be declined.

I have quoted so much from this distinguished article for two reasons: 1. It virtually sums up and confirms all that I have said so far, and (2) it indicates the chief points that I have to make.

"Recent investigations" writes Dr. Mackenzie, "*constitute a challenge* that cannot be declined," As things stand today, we really, except pragmatically, know little about this whole question. As I see it, the outstanding need of health service today is scientific research in the oral region, and in problems affecting oral health. In an exhaustive survey of "dental needs and dental facilities with special reference to a dental program for Chicago," Michael M. Davis, Ph.D., states:

> Research into the conditions and causes of dental decay and into the methods of its prevention is of fundamental importance. The entire program of dentistry may be radically changed by future discoveries of specific causes of dental decay and agents of infection. Definite provision for research is supremely important in any program for a community large enough to support a dental institution of the first rank associated with medical and dental education.

As Dr. Newman[7] wrote in 1923:

> What is of much greater importance than any actual work undertaken is the introduction of the *methods and spirit* of research as an essential factor in the routine of the University Clinic. Let us cultivate no illusion in this matter. To assume that the ordinary fourth or fifth year medical student is capable of extending in any worthy degree the frontiers of exact knowledge is futile and reveals a misapprehension of research. Worthy research requires a prepared mind, experience, leisure, imagination, learning and high technique. It is not for the inexperienced undergraduate with other tasks on hand. But there is here, nevertheless, something vital for him, which has hitherto been gravely neglected in our national schemes of Medical Education, and that is to learn to love research, to know its methods, to be moved by its spirit, to appreciate its stupendous achievements, to recognize that in it and in it alone can the future be secured. This is what we have neglected to teach him. It has been explained to him that all knowledge comes by scientific investigation and research, clinical as well as other. Moreover, the teacher who is not imbued with the spirit of research is unable to teach, and thus it comes about that an inspired teacher and a seeing student are the two desiderata.

If this is true of medicine and the medical student, how much more is it true of dentistry and the dental student! Ideally, dentistry is the equivalent of a specialty in medicine, with all the problems—and more—of any other specialty. But it has heretofore been a much neglected child. The larger problems it presents (and how greatly they affect the general welfare I have

7. Newman, George: Recent Advances in Medical Education in England.

attempted to show you) have been ignored, while we have gone on plugging up holes and making fine jewelry—often covering up, as Dr. Hunter pointed out in 1910, a frightful and menacing mass of sepsis. This has got to end. If we are to do anything like our duty to the public, to fulfil in the slightest measure our claims to being a dignified profession, we must look up from our toothfilling and recognize the magnitude of the task that confronts us. We must educate ourselves in the scientific aspects of our profession first, or we shall continue to do more harm than good. What Dr. Newman writes of preventive medicine in "Recent Advances in Medical Education in England" is equally true of dentistry.

> Preventive medicine thus found its modern application and practice in the ordinary day-by-day work of the medical practitioner. Its foundations and its superstructure are *medical*, though engineers, analysts, administrators and municipal workers are its agents in certain communal fields of its application. But even today, when the broad principles of Preventive Medicine are understood by the lay public, and when the State and the Local Authority through special medical officers are engaged in carrying some of them out on a communal scale, much of the actual investigation and differentiation is falling to the medical practitioner. He is, and must remain, not only one of the public, but he himself should be a discoverer and practitioner of prevention.

This is true, ideally, of the dentist as of the physician. But how is either to do this without knowledge? Our crying need, I reiterate, is education—broad, scientific education in the principles underlying health problems. Only when we have educated ourselves will we be fit to educate our patients.

Dr. Newman,[3] again, has a word for us:

> Every advance in our knowledge increases the potential capacity of man. But the mere increase of knowledge, and particularly the knowledge of Preventive Medicine or the ways and means of personal hygiene and well-being, can do nothing of itself to prevent disease and to safeguard health, unless it be *understood, accepted and practiced.* So long as it remains exclusive or esoteric it can accomplish little, it can work no mighty deeds. It must filter down through all sections and conditions of society. It must become the common property of the people. It must arrest the attention of the individual and create in him a desire to know and to act on his knowledge—a desire which will spring from self-interest and self-preservation on the one hand, and from a sense of accord with public opinion and the collective consciousness on the other, an awakened sense of communal responsibility. Professor Dicey pointed out long ago that the development of English law was (a) slow but continuous, and (b) the result of public opinion and of practical self-interest. Thus also has it been with the growth of the social application of Medicine. Sound practice, as a rule, lags behind the ascertainment of truth. Popular education is the process by which we reduce the interval between the two.

As it is stated in the latest published report of the Carnegie Foundation for the Advancement of Teaching:

> The outstanding deficiency of the science of dentistry has been its inability, hitherto, to lay the foundations for discovery of methods for the general prevention of decay of teeth and of diseases of the closely adjacent tissues. Discovery of means to these fundamental ends would revolutionize the practice of dentistry by eliminating most of the occasion for it. Although these disorders are among the most commonly occurrent of all bodily ailments, medicine has ignored them; and dentistry, in her absorption of oral mechanics, has been helpless before them and, until recently, has been content to follow with repairs, reconstructions, and replacements. The primary causes of dental decay and of periodontal disease appear to be hidden in the biological secrets of the conditions or processes of dentition and nutrition, or of oral variability, or of all of them; and it seems probable that the causative influences, whether related to

defective dental development or impaired nutrition, or involved in particular conditions of dental environment, will not be discovered until the medical sciences are used effectively to that end. When dentistry becomes equivalent to an oral specialty of medicine, dental vision and effort, combined with biological understanding and aided with methods of enquiry of corresponding adequacy, may be expected to bring these dental maladies into the realm of the completely preventable disorders, if that should not be inherently unattainable. Comprehensive and penetrating research in these relationships is a basic need for the universal promotion of human welfare.

Only by this means shall we be in a position to do our duty toward the public. "The work of the dentist," wrote the late Dr. Talbot in 1919,[8] "is confined to the care of the teeth. Should not his business be, above all others, to develop perfect teeth for his patients and thus avoid decay? Should not prophylaxis be the main aim and goal for the future practice of dentistry, since health, longevity, and happiness depend upon sound teeth?"

"The great men of culture," wrote Matthew Arnold in *Culture and Anarchy*, "are those who have had a passion for diffusing, for making prevail, for carrying from one end of society to the other, the best knowledge, the best ideas of their time; who have laboured to divest knowledge of all that was harsh, uncouth, difficult, abstract, professional, exclusive; to humanize it, to make it efficient outside of the clique of the cultivated and learned, yet still remaining the *best* knowledge and thought of the time, and a true source therefore of sweetness and light."

When we set ourselves definitely in this path, with the acquiring and disseminating of the knowledge affecting our profession as our goal, I believe we shall have taken the most effective step toward promoting the avowed object of our Congress: "The advancement of dental science in its relation to public health."

8. Talbot, E. S.: Bone Absorption Around the Roots of Teeth, Dent. Cosmos, 61: 361 (May) 1919.

PRESENT-DAY TENDENCIES IN ORTHODONTIC THERAPY*

By HERBERT A. PULLEN, D.M.D., F.A.C.D., Buffalo, New York

A PROPER perspective of the present-day tendencies in the therapy of orthodontia should consistently relate itself to the inspiring motif of this great congress: "The advancement of dental science in its relation to public health." A casual survey of the orthodontic field at the present time reveals an earnest effort on the part of the orthodontic specialist to solve the so-called "orthodontic problem," which is fundamentally a health problem; so that he may contribute his share in that advancement of dental science which shall survive because of its beneficial therapy in the improvement of the health of the individual.

Dentistry, in its relation to public health, has been on the firing line ever since Dr. Mayo stated that the next great step in preventive medicine must come from dentistry, and it has entrenched itself for all time by its campaign on focal infection in dental and alveolar tissues, against the attacks of those who might criticize, and its recent slogan, "Add ten years to life," seems within reasonable distance of attainment through its constructive work in the prevention and cure of many human ills attributed to preventable dental lesions.

This forward movement in the dental field is noted in all of its specialties, including orthodontia, and it has its reactions, the chief of which is the consciousness of the dentist, or the dental specialist, that he is not fully equipped in the way of a medical education for diagnosing bodily disease due to focal infection around the teeth or in their investing tissues.

Ever since orthodontia was inaugurated as a specialty, and even before, the orthodontist has felt this need of a better education in general medicine, more keenly, if possible, than the general practitioner of dentistry; for he felt that "the orthodontic problem" was fundamentally a biologic one, which could be solved only by turning the searchlights of all of the branches of medicine on it, so that a more correct knowledge of the etiology and diagnosis of arrested growth of the maxillary arches, of malocclusion and maldevelopment of the dental arches might be thereby acquired, and the therapy of these conditions carried on along lines prescribed by the therapy of general medicine, assisted by the mechanics of orthodontia.

Primarily, orthodontia concerns itself with the form, size, and relations of the dental arches, with their growth

*Read before the Section on Orthodontia at the Seventh International Dental Congress, Philadelphia, Pa., Aug. 26, 1926.

and development and with the factors causing their arrested development or maldevelopment. Secondarily, it has to do with the therapeutic agencies which lend themselves to the relief of abnormal conditions of growth and development of the dental arches in malocclusion and facial deformity.

Each of these phases of the "orthodontic problem" are linked with the physiologic and pathologic processes of the body as a whole, with nutrition and metabolism, with disease and deformity, with respiratory insufficiency and endocrine imbalance, with heredity and environment, with prenatal and postnatal factors in the etiology of malocclusion which are puzzling in their obscurity, et al. It is evident that these various phases of the "orthodontic problem" can be solved only by the light of biology, through which the oculist, aurist, rhinologist, orthopedist, pediatrician and other specialists in medicine solve their problems, for their problems are one and the same.

With the view, no doubt, of improving the therapy of orthodontia thereby, it has occasionally been stated that one could practice better orthodontia with a medical training and medical degree only, and no dental training. The therapy of orthodontia would suffer more from such a lack of training in the mechanics of dentistry than it now does from a partial lack of the fundamentals of medicine. Dr. Stillman's assurance that[1] "what dentistry needs for its development is not more science and less mechanics, but more science and better mechanics" is as true of orthodontia as of dentistry.

1. Stillman, P. R.: Occlusion—The Fundamental Element in Dental Science, Internat. J. Orthodontia, 11: 824-835, 1925.

In spite of the apparent progress of orthodontic therapy along the lines of its medicotherapeutic aspect, the "orthodontic problem," being fundamentally a biologic problem, is only partially solved, owing primarily to an insufficient knowledge of etiologic factors, which, as in general medicine, link themselves so closely to therapeutic endeavor that progress can be made only while they travel arm in arm.

For evidence that an earnest effort is being made by the orthodontist to solve the "orthodontic problem" from a biologic basis, one has only to read the recent literature of orthodontia, in which it will be seen that the biologic point of view and the application of orthodontia on this basis is the strongest tendency of the present day.

The late Calvin S. Case was an enthusiastic student of biology, and incorporated some of its teachings in his recently published work on dental orthopedia. He says:[2]

> In the biologic field will be found much of interest and practical instruction to orthodontists, especially in the principles of heredity and natural variation which pertain to causes, and in ethnology which relates to the origin and development of races of peoples, with their characteristic types of physiognomies. . . . It lies at the very foundation of nearly all the scientific branches which we regard as imperative to teach in our dental colleges, and it is especially important to orthodontists, because it shows them the true etiologic origin of many of the dento-facial malocclusions they are called upon to treat; and in so doing it guides them toward their true correction.

During the last twenty years or more, orthodontia has been developing this biologic point of view by rather slow

2. Case, C. S.: Practical Treatise on the Technics and Principles of Dental Orthopedia and Prosthetic Correction of Cleft Palate, Chicago, 1921.

strides, owing in part to the marvelous results of treatment from the standpoint of occlusion, which, for a time, seemed all that could be desired, and, in part, to the lack of research workers in the orthodontic field. In no small measure, it has been due to the students of Angle, who, having started with his concept of the possibilities of research in the orthodontic field, have developed the biologic point of view from observation and experience as the various problems of a biologic nature, of growth and development, of heredity and variation, of environment and the laws of harmonious development, of occlusal variation, etc., have presented themselves for solution.

It has remained for a brilliant student of the biologic school, Milo H. Hellman, to suggest a change from the apparently fixed focus on mechanics of the orthodontic camera to a more universal one, by stressing the other phenomena involved. He writes:[3]

> It is the indiscriminate use of the term "mechanics" in its relation to orthodontia that confuses most of us. Thus, malocclusion of the teeth is assumed to be due to various mechanical causes of pressure; mechanical principles are employed to construct an orthodontic appliance; the appliance is used as a mechanical means to move the malposed teeth into the line of occlusion; it is assumed that the mechanical apparatus causes the teeth to move in accordance with physical law; and when in normal occlusion the teeth are assumed to present a mechanically perfect apparatus. We are, therefore, so impressed with the idea of mechanics in its various manifestations that we lose sight of all other phenomena involved. . . .
>
> It is therefore, evident that the vital processes concerned in orthodontic procedure are the most important phenomena the operator has to contend with, and that the tissue changes incident to the movement of a tooth are entirely subservient to biologic limitation. We must, therefore, discipline ourselves to think in terms of biology when tooth movements are involved, despite the means employed to bring them about. . . .
>
> To reconcile this two-fold aspect, it is deemed of considerable advantage to introduce a term that will readily suggest the exact scope of the problem we are confronted with. As life processes are manifested in the response to physical stimulation, the indications of both must be made evident in our terminology. "Biomechanics" will more nearly explain the procedure involved than the term hitherto employed. Fusing, as this expression does, the mechanics applied in the delivery of a force and the biologic manifestation obtained as a result, it at once suggests the movement of teeth as being associated with *vital and mechanical processes.* The idea thus conveyed will at once put an end to the misconception relative to a purely mechanical procedure, as it implies also the tissue changes taking place during orthodontic treatment.

Orthodontic therapy cannot do otherwise than benefit from this conception of the processes involved in tooth movement and the tissue changes resulting therefrom. It will receive still greater benefit when the teaching of the biologic concept has become more nearly universal than it now is. That there exist tendencies along this line is all too evident from the changes in the curriculums in many of our dental colleges, to give a broader undergraduate foundation in the biologic sciences in medicine, stimulated, no doubt, by such utterances, and others of similar import, as have just been quoted.

Other writers along the lines of orthodontic education have stressed the responsibility resting on the dental teachers in giving comprehensive instruction which shall include the biologic concept as a fundamental basis of orthodontic theory and practice. Promi-

3. Hellman, M. H.: Mechanics in Orthodontia from a Modern Aspect, Dent. Cosmos, 62: 1385 (Dec.) 1920.

nent among these is A. Leroy Johnson,[4] who remarks:

> The biologic point of view sees malocclusion of the teeth as an indication of a typical development to be studied in the light of correlative variation. The knowledge that constitutes the foundation for the study is that relative to the normal processes manifest in growth, development and functional phenomena of the dental apparatus. . . . While undoubtedly, for the present at least, the greatest service we can render is by means of mechanical treatment, the biologic concept extends the field of orthodontic treatment to include surgical and medicinal means as well. It recognizes the fact that there are cases where extraction is indicated, that there are cases dependent upon therapeutic agencies, and there are those that respond to the conventional methods of mechanical treatment. . . . Instead of cheapening this field of work, instead of breaking down the high ideals that have characterized its growth, a sound biologic concept removes from orthodontia much that is bad and directs that which is good into channels of service to humanity.

One might ask what practical results in orthodontic therapy are accomplished by adopting the biologic point of view. In answer to this question, it may be said that, primarily, it enlarges the diagnostic vision of the orthodontist so that he looks back of and beyond the end result of abnormality in the malocclusion of the teeth to the incipient constitutional tendencies or causes, such as a possible bad heredity or environment, a deficiency in calcium metabolism as evidenced by rachitic symptoms, an endocrine imbalance, malnutrition, respiratory insufficiency with adenoid-tonsil complications, malocclusional habits, *et al.*, any one of which may have produced a type of malocclusion so fixed in its nature that it may be next to impossible to correct it.

Secondarily, it opens up all of the therapy of general medicine to assist in the building up of the nutritive and growth processes of the patient, and to correct and subvert abnormal processes of growth, bad habits, *et al.*, through medicinal, surgical, or psychotherapeutic means. Finally, it focuses the attention of the orthodontist on the changes taking place in the tissues in which the teeth are imbedded rather than on the teeth themselves, so that through a more definite knowledge of these tissue changes as a result of mechanical stimulation, the appliances may be so constructed and adapted for dental arch development as to assist and not hinder growth processes in the alveolar tissues.

Orthodontia, even with its present insufficient knowledge of the biologic factors involved, has sold itself to the dental profession and to the public, which is awake to the crying need of orthodontic service, and the orthodontist is attempting, under almost insurmountable difficulties in many cases, to live up to his reputation and scientifically diagnose and treat malocclusions which are extreme in their type, and which involve a complicated etiology.

These extreme cases of malocclusion, which almost defy diagnosis and treatment, present themselves not infrequently to the orthodontic specialist, who at least can recognize them, and if he cannot improve conditions, will leave them untreated. Not so, however, with the dentist, who is much more benighted in regard to diagnosis of malocclusion and correct therapeutic procedure in such cases; for it is observed that he cannot and does not discriminate between the cases which are amenable to treatment and those which

4. Johnson, A. L.: Basic Principles of Orthodontia, Dent. Cosmos, 65: 957 (Sept.) 1923.

are not, treating all cases from the mechanical aspect of realining malposed teeth, as if they were locally rather than constitutionally misplaced.

The dentist does not realize that all possible causes of malocclusion should be looked into from the constitutional rather than the local aspect, as malocclusion of the teeth is usually symptomatic of systemic disturbance of greater or lesser degree, and the possibilities of successful treatment of malocclusion depend largely on the response to growth stimulation in a healthy organism.

The biologic concept of orthodontia focuses the attention of the orthodontist primarily on the faulty growth of the structures in which the teeth are imbedded rather than on the end-result of malocclusion. In an essay on etiology[5] published in 1908, this point of view was stressed: "Malpositions of the teeth, in general, are but objective symptoms of abnormal development of the dental (maxillary) arches. . . . "Occlusion, normal or abnormal, depending as we have seen, upon earlier developmental conditions, is not of primary import in the study of orthodontia, since it is governed entirely by certain developmental factors which precede the perfection of occlusion by several years."

Lundstrom,[6] in 1925, designates the orthodontic problem as "a problem of the apical base," thus again diverting the attention of the student of orthodontia from the mechanical therapy of occlusal restoration to the possibilities of a therapy based upon the etiology of an arrested growth of the apical base or of the bone of the maxillary arches.

Again, the biologic concept of orthodontia does not admit of the assumption of the theory that the first permanent maxillary molar is constant in its relation to the cranium, upon which hypothesis the Angle classification of malocclusion is based. Lundstrom[6] declares the concept of normal occlusion to be the assumption of a false theory. Simon[7] states that the concept of the constancy of the first molars "belongs to the realm of fictions, about which any theory may be built, and which will serve as a temporary state of affairs, not claiming any scientific truth, but only the greatest possible usefulness according to the then state of the science."

He adds: "And it will now also be understood, why Angle's system has met with such great approval. The dogma of (the constancy of) the molars is indeed scientifically wrong, but it is very useful in a practical way, for with its help it is easily possible to get the great variety of malocclusions into a certain order and a certain view."

The value of this constructive criticism of the fundamental doctrines of orthodontia, while it may be of no immediate consequence to the dentist, has given a great inspirational stimulus to the orthodontist in providing a newer conception of orthodontic therapy based upon more scientific methods of diagnosis.

Simon's gnathostatic and photostatic methods of diagnosis by which is de-

5. Pullen, H. A.: Import of Certain Etiological Factors in Treatment in Orthodontia, Dent. Cosmos, 50: 1301 (Dec.) 1908.

6. Lundstrom, A. F.: Malocclusion of the Teeth Regarded as a Problem in Connection with the Apical Base, Internat. J. Orthodontia, August-December, 1925.

7. Simon, P. W.: On Gnathostatic Diagnosis in Orthodontics, Internat. J. Orthodontia, 10, December, 1924.

termined the variation of the occlusion from the normal in three distinct planes, the orbital, eye-ear and median-raphé planes, is receiving the support of the broad minded student of orthodontia, for it forms the basis of the only scientific classification which can improve on the Angle and Case classifications now in use. Simon's method of diagnosis is also based upon a fiction, but it has a greater practical usefulness than previous methods because it corrects their errors and extends the diagnostic field to almost limitless possibilities.

By means of its use, the question as to whether the maxillary teeth are in forward or backward relation to the cranium comes as near to being scientifically settled by cephalometrics as is possible, and a new light is thrown on the problem of the therapy of the extraction of teeth in the sagittal anomalies. A new concept of the normal jaw is thereby also obtained, which is more scientific than, and accounts for the deficiencies in, the normal occlusion concept.

The therapeutic value of engineering methods, or surveys of the dental arch, have not been of so much value as has been hoped by those who have produced them; for, although a predetermined arch form can be obtained by a survey and charting of the permanent teeth in malocclusion, it is only of relative value, for it is obviously impossible to survey the growth of the jaws, which follows biologic rather than mechanical predetermination.

In radiographic diagnosis, a reasonable therapy demands the unrestricted use of the radiogram in obtaining full radiograms of the jaws with the purpose of predetermining the anomalies of dentition, the positions of impacted teeth, diseased areas, absorption of tooth root surfaces or apices, the position of third molars, *et al.* If, in the radiogram of the third molars, these teeth are found to occupy such malpositions as would later cause crowding of the other teeth in the dental arches, their early extraction may be thus indicated.

The mechanical therapy of orthodontia, as far as the perfection of the appliances themselves is concerned is not capable of much improvement, for they have about reached the limit of their evolution, and the mechanical therapy of the future will be judged more from the standpoint of a simple prophylactic appliance than from a complex and more efficient one, which is necessarily less prophylactic.

Muscle training, or kinesitherapy, has taken its place in the therapy of orthodontia, along the lines laid down by A. P. Rogers, who has developed the technic for scientific training of the weakened and abnormal muscles of the face associated with malocclusal defects.

Psychotherapy, in the gaining of the conscious control of and cure of abnormal sucking and biting habits, is a great addition to orthodontic therapy, and is one of the fundamentals of kinesitherapeutic treatment which has just been considered.

The ramifications of present-day orthodontic therapy extend beyond the realm of orthodontia proper into the field of periodontia, for while malocclusion is not always traumatic occlusion, it frequently is, and as such needs the treatment suggested by the periodontist, and occasionally used, but not stressed, by the orthodontist, of balanc-

ing the occlusion in order to secure healthy alveolar and periodontal tissues.

Stillman[8] says:

> When there is a lack of balance in the occlusal relationships of the teeth, whether natural or artificial, certain teeth receive an occlusal stress in excess of that which Nature and the laws of mechanics decree. This produces in time an irritation of the entire periodontium, which may manifest itself in either vascular or neural disturbance, or both. Through this disbalance of physiologic equilibrium, local nutrition is interfered with and infection induced. . . .
>
> When we realize that the most prominent, although perhaps not the sole cause of rarefying pericementitis fibrosa is traumatic occlusion, we are amply justified in attempting to balance the occlusal relations whenever we find so marked a lack of harmony as to make it obvious that the patient cannot correct it by ordinary occlusal wear. . . .
>
> Due to the yielding character of the periodontium, even though very slight in extent, natural self-adjustment is seldom carried to that point of perfection requisite for the attainment of adequate occlusal balance.

It is evident that malocclusion must often be traumatic occlusion in which there is an unbalanced occlusal stress, although in the younger cases, after restoration of normal occlusal relations, the occlusion becomes balanced through a process of self-adjustment, and traumatic occlusion of a temporary nature is permanently relieved. In the older cases of malocclusion which are traumatic, the restoration of arch forms and cusp relationship does not always relieve the trauma, and in these cases the cusp-grinding technic of the periodontist must be called into play to effect the finer adjustments of occlusal balance.

Thus, it is that the trend of orthodontic therapy suggests the study and attainment of balanced occlusion in the field of the periodontist, if orthodontia is to do its full share in conserving the health of the individual.

Furthermore, in comparing the work of the prosthodontist in his study of the occlusion of artificial teeth in the excursive positions of the mandible with that of the orthodontist in his study of the occlusion of the natural teeth in similar excursive positions of the mandible, it would seem that the former, under such leaders as Gysi, Monson and others, have solved certain basic problems in mandibular movements and occlusal balance which should long ago have been applied to occlusal restoration in orthodontia, and toward which methods some tendencies exist in orthodontic therapy.

Preventive orthodontia is not a new field in orthodontic therapy, but, because of the clientele of the orthodontist being confined so largely to children, a closer study of preventive methods has been inaugurated, thus enlarging the field for this work to an unlimited degree.

Progress along the line of preventive methods in orthodontia naturally leads to a further advance in orthodontic therapy, viz., through prophylaxis of the mouth and teeth. In this field in particular, there has existed a need for a simple appliance for dental arch development which would interfere the least with the natural cleansing action of the fluids of the oral cavity, of the tongue, lips and cheeks.

The removable locking lingual arch, which has been elaborated by Dr. Mershon, has so solved this problem in the simpler cases of malocclusion that it is recognized as one of the greatest boons to oral prophylaxis during that

8. Stillman, P. R.: Occlusion—The Fundamental Element in Dental Science, Internat. J. Orthodontia, 11: 824-827, 1925.

trying period of heedlessness to mouth hygiene exhibited by almost every child.

The use of the least instead of the maximum number of bands on the teeth, the construction of the inclined plane in loop wire form, and the discarding of ligatures on the teeth, except on special occasions, are all tendencies toward a prophylactic therapy which is essential to modern orthodontia.

Apropos also of this tendency is the leaning again toward the simplification of all orthodontic mechanism after a period which has been noted for its use of complicated appliances, which, although more efficient in certain cases requiring a more positive control of individual teeth, interfere seriously with the natural cleansing functions in the oral cavity.

Orthodontic therapy has certain natural limitations, and one of them is the failure of Nature to grow the tissues of the jaws by any prescribed mechanical action of orthodontic appliances acting directly, though ever so gently, on these tissues. "Bone-growing" is a catchy and subtle but unscientific phrase, introduced into orthodontic literature for the purpose of bolstering up defensive arguments for the use of certain forms of appliances which are recommended as being more correctly adapted for this purpose than any other.

One of the lessons which biology teaches us is that the appliances used for orthodontic treatment are more nearly perfect in their adaptation when the force which they exert to stimulate growth, if this is the proper term to denote the action of an appliance on the osseous structures of the jaws, is adjusted to imitate if possible Nature's own time-rate for growth in the jaw itself, which is slow, gradual, periodic and unmeasurable.

Any appliances, therefore, which are advertised to shorten the time of treatment, can only defeat their own object, for any attempt of this kind with any type of appliance tends to bring about destructive processes in the alveolar and dental tissues which may be beyond repair.

Relative to the selection of appliances for orthodontic therapy, there seems to be extant a desire for eclecticism, or the use of all of the various types of appliances which should be restrained to some degree; for, as the violinist or pianist is a master of one instrument only, so the orthodontist should be the master of one type of appliance primarily before he attempts the mastery of half a dozen types of appliances to the detriment of his skill and ingenuity with the one.

There is no doubt that the basis of efficiency of modern orthodontic mechanisms is a fixed anchorage, when possible, from which to exert force, thus placing the removable appliance always secondary to the fixed appliance, except in special cases and in retention of certain cases.

Although the therapy of the bodily movement appliances, so-called, seemed to be reasonable from a theoretic standpoint, in practice there is a growing tendency to minimize their use, because of their menace to the health of the alveolar and dental tissues, in unskilled hands, and just here a word of caution to the dentist may not be malapropos, for the unexpected sequelae in these tissues from the use of the appliances as revealed by the radiogram are some-

what disconcerting, if not alarming, in certain cases.

In orthodontic therapy of today, the child is the center of interest, as in other branches of medicine, for preventive orthodontic therapy must begin with the child, and anything that interferes with its growth and development must be recognized as a possible etiologic factor in arrested or abnormal growth of the jaws. Orthodontists have especially interested themselves in endocrinology, as exemplified in the work of Clinton Howard and others, as offering a promising field of study of etiologic factors of arrested or abnormal growth of the child, although little has been discovered of actual therapeutic value except along the line of thyroid therapy.

Orthodontia is following in the footsteps of general medicine in its study of the nutrition, growth, and development of children, but is likewise puzzled by the taint of a bad heredity, or by the variation of the child from an unknown normal condition of health. Herbert Hoover, in addressing the American Health Congress, said:

> Sometimes, as we have incidentally watched the scientific efforts to approach and define the normal, we have been struck by the thought that what they were striving for, what they were seeking to define, what they were using as the basis of measurement was perfection and not normality. The normal child, for instance, is not a perfect child. Few perfect children appear to be born into this world. They come into the world with various defects, mental and physical. Some of them are overcome and some of them are not. Some of them can be overcome and apparently some of them cannot. Who can say, then, what is the normal, when it must be admitted that it is less than perfection? . . .
>
> The normal child of the year 1800 will not serve us today. Our standard of normality is on a higher plane. Define for us progressive normality, twenty-first century normality, that we may strive for in the twentieth century. Picture to us in words, in crayon and in scientific fact the child that Nature, working at its best, intended. Describe to us in terms that fathers and mothers can understand the child whose organs are functioning efficiently, whose growth is proceeding unimpeded, whose senses are developing unhampered and whose potentialities are being realized, mentally, morally and physically.

Orthodontia is likewise attempting to discover the normal child, and although it may never succeed in this secondary object, its beneficient therapy is doing as much as any other science to make the normal child a possibility, and thus doing its share in the restoration of health, and the attainment of beauty in a well-balanced physical organism of the present day child.

675 Delaware Ave.

A REPORT ON A STATISTICAL INVESTIGATION ON THE LOSS OF HUMAN TEETH*

By PETER J. BREKHUS, B.A., D.D.S., Minneapolis, Minnesota

WHAT is the status of the dental health of the public at the present time?

This is a question of vital interest to the dental profession. How have we succeeded in building it up and preserving it? Arthur D. Black[1] said, in a recent publication, that "Dental caries—the most prevalent pathologic condition—is *increasing* with the advance in civilization, and is an important factor in relation to general health." This statement verifies data gathered from many sources, but actual figures on the loss of human teeth have not been available.

No private practitioner could possibly assemble sufficient data to warrant any generalization one way or another; first, because of the necessarily limited number of patients, and, secondly, because of the tendency to specialization on certain kinds of work and certain classes of people. At the Infirmary of the College of Dentistry of the University of Minnesota, we have patients from nearly all walks of life, and of all ages. We have business men and professional people, industrial workers and common laborers. It is true that the majority of our patients come from the poorer class, but they do belong to classes of people who are seeking, and have received, a great deal of dental treatment. We therefore felt that this institution was as nearly an ideal place as possibly could be found to collect reliable information.

During the school years 1923-1924, 1924-1925, we collected case records of 9,450 patients, ranging in age from 9 to 75 years, 5,370 female, and 4,080 male. We now felt that we had a sufficiently large number to arrive at conclusions of some validity.

The third molars have not been included in this tabulation for the reason that we found it impossible without full mouth roentgenograms in all cases to determine whether the tooth in question had been extracted, was impacted or was missing. Full mouth roentgenograms in all cases would have been prohibitive on account of cost to the patients, and any information that does

*Conducted in the Division of Oral Diagnosis at the College of Dentistry, the University of Minnesota, 1923-1926.

*Summary of a report read before the Section on Mouth Hygiene, Preventive Dentistry and Public Health at the Seventh International Dental Congress, Philadelphia, Pa., Aug. 25, 1926.

1. Black, A. D.: Prevention in Dentistry, J.A.D.A., 13: 582 (May) 1926.

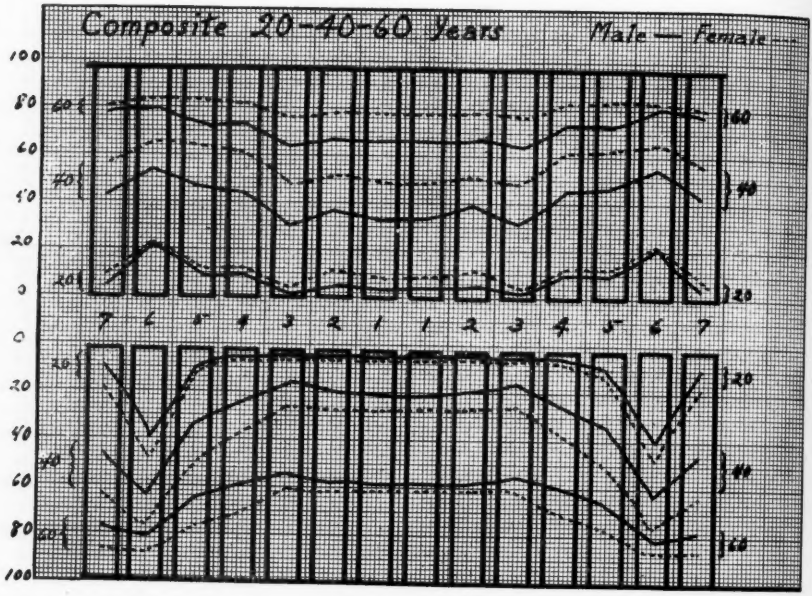
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Fig. 1

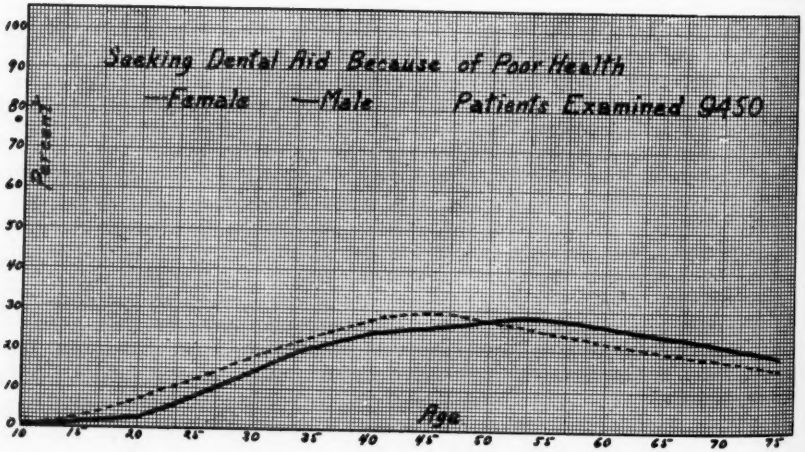
Seeking Dental Aid Because of Poor Health
—Female —Male Patients Examined 9450
Per Cent
Age
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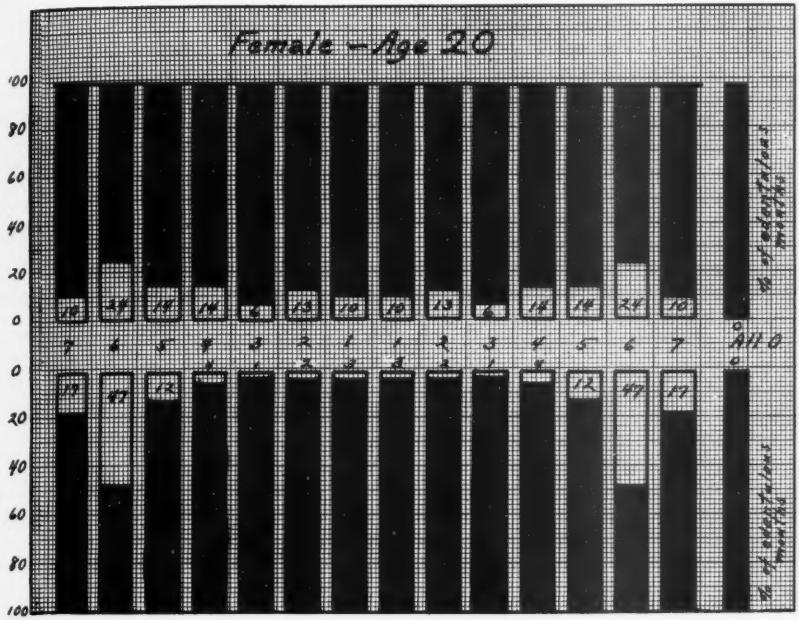
Fig. 2


Female — Age 20
100
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100
% of subjects having teeth
% of subjects having teeth missing
All 0

Fig. 3

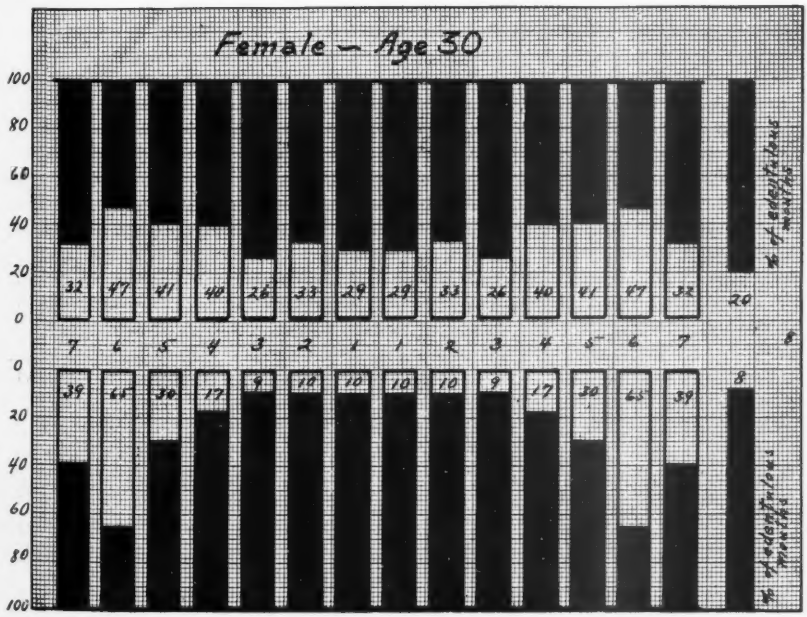
Female — Age 30
100
80
60
40
20
0
0
20
40
60
80
100
% of subjects having teeth
% of subjects having teeth missing

Fig. 4

TABLE 1.—RELATIVE LOSS OF TEETH DURING THE AGES FROM 10 TO 75 YEARS IN MALES AND FEMALES*

	Age	10	15	20	25	30	35	40	45	50	55	60	65	70	75
I. 6	M.	10	30	40	45	50	55	63	70	72	77	80	85	88	90
	F.	15	35	47	57	65	72	75	78	82	83	86	88	92	92
II. 6	M.	5	15	23	35	40	50	55	62	69	75	81	86	89	93
	F.	5	15	24	35	47	56	67	72	78	80	85	88	92	93
III. 5	M.	0	3	11	18	29	40	48	57	62	68	75	80	86	90
	F.	0	3	14	30	41	55	65	72	78	82	85	90	92	93
IV. 4	M.	0	4	11	18	29	37	46	55	62	67	75	80	86	90
	F.	0	3	14	27	40	55	63	73	77	82	84	88	91	94
V. 7	M.	0	2	8	16	25	35	45	55	63	67	76	82	87	90
	F.	0	3	17	25	39	50	62	70	76	80	85	88	92	95
VI. 7	M.	0	0	3	12	21	33	44	60	64	73	79	83	90	93
	F.	0	1	10	20	32	45	58	68	73	78	82	88	92	93
VII. 5	M.	0	3	9	13	19	26	33	41	49	56	64	70	75	79
	F.	0	3	12	22	30	42	50	60	65	72	76	80	86	90
VIII. 2	M.	0	2	6	10	20	30	39	48	55	62	69	74	81	85
	F.	0	2	13	18	33	41	53	63	69	75	80	86	89	96
IX. 1	M.	0	¼	2	10	18	25	35	44	51	60	68	75	82	88
	F.	0	2	10	18	29	40	50	60	67	75	79	83	89	94
X. 3	M.	0	0	½	6	14	22	32	45	49	58	66	75	82	88
	F.	0	0	6	15	26	40	50	60	67	72	78	81	87	95
XI. 4	M.	0	0	1	6	10	15	23	30	40	47	58	64	70	73
	F.	0	2	4	9	17	26	36	45	54	64	70	75	82	86
XII. 1	M.	0	0	1	2	6	12	20	28	39	48	58	65	72	76
	F.	0	0	3	6	10	17	26	33	43	50	60	68	78	86
XIII. 2	M.	0	0	¼	1	6	10	18	25	34	45	57	62	70	74
	F.	0	0	2	4	10	16	26	36	43	54	60	66	78	86
XIV. 3	M.	0	0	¼	1	4	7	15	23	33	42	53	60	66	69
	F.	0	0	1	4	9	16	25	36	41	53	60	65	78	85

*Cases I, V, VII, XI, XII, XIII and XIV are lower teeth; others, upper teeth.

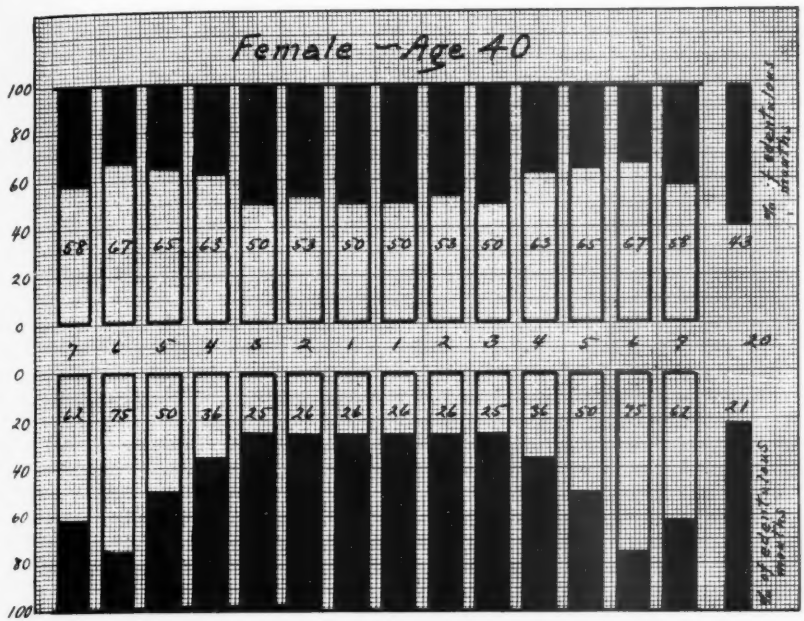
Female – Age 40
100
80
60
40
20
0
68 67 65 65 50 53 50 50 58 50 63 65 67 58 43
7 6 5 4 3 2 1 1 2 3 4 5 6 7 20
0
20
40
60
80
100
62 75 50 36 25 26 26 26 26 25 36 50 75 62 21

Fig. 5

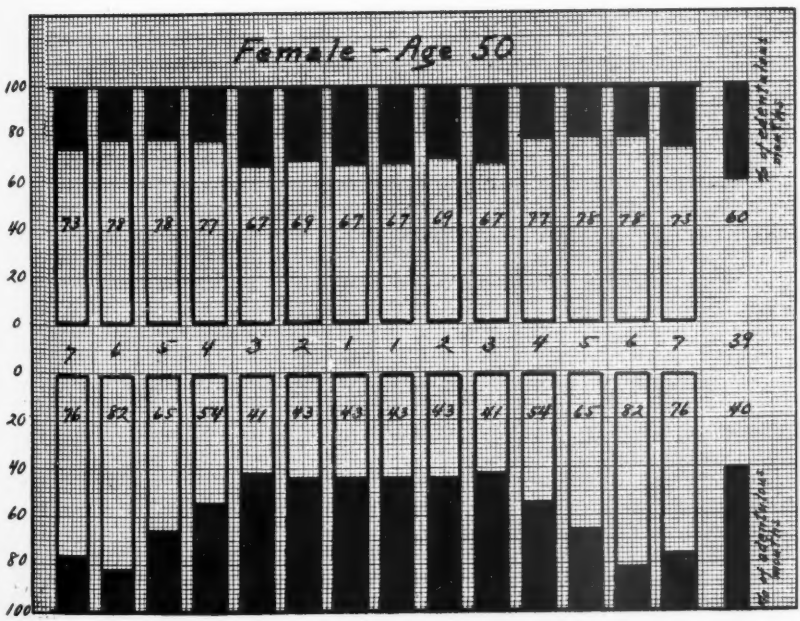
Female – Age 50
100
80
60
40
20
0
73 72 78 77 62 69 67 67 69 67 77 78 78 75 60
7 6 5 4 3 2 1 1 2 3 4 5 6 7 39
0
20
40
60
80
100
76 82 65 54 41 43 43 43 43 41 54 65 82 76 40

Fig. 6

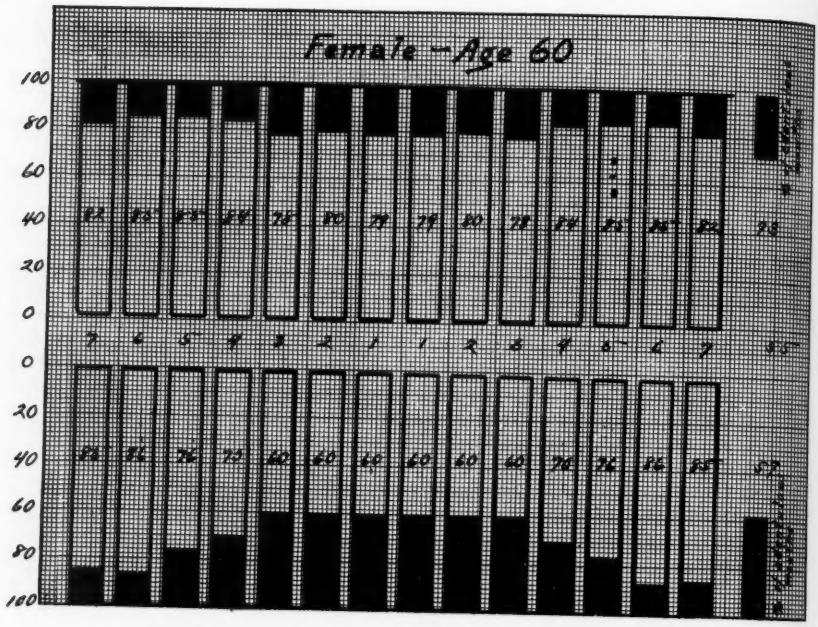
Female - Age 60
100
80
60
40
20
0
0
20
40
60
80
100

Fig. 7

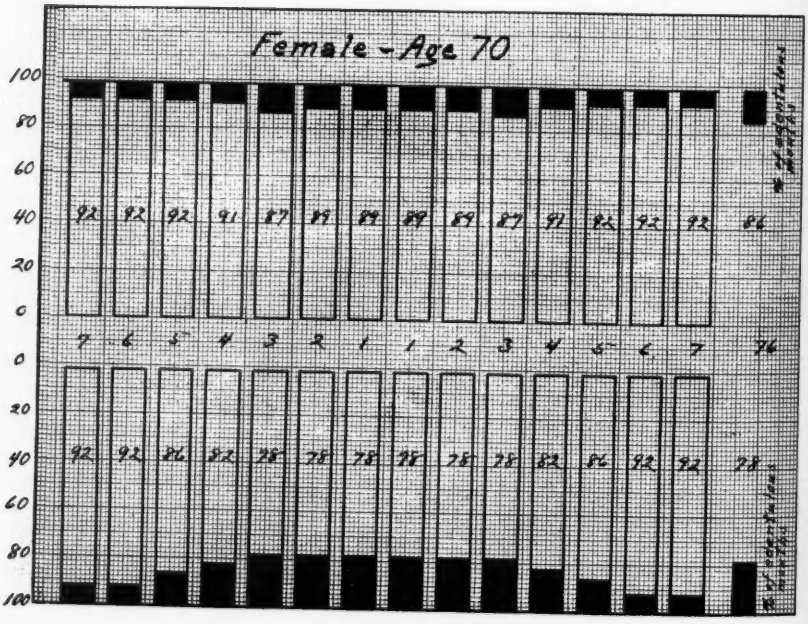
Female - Age 70
100
80
60
40
20
0
0
20
40
60
80
100

Fig. 8

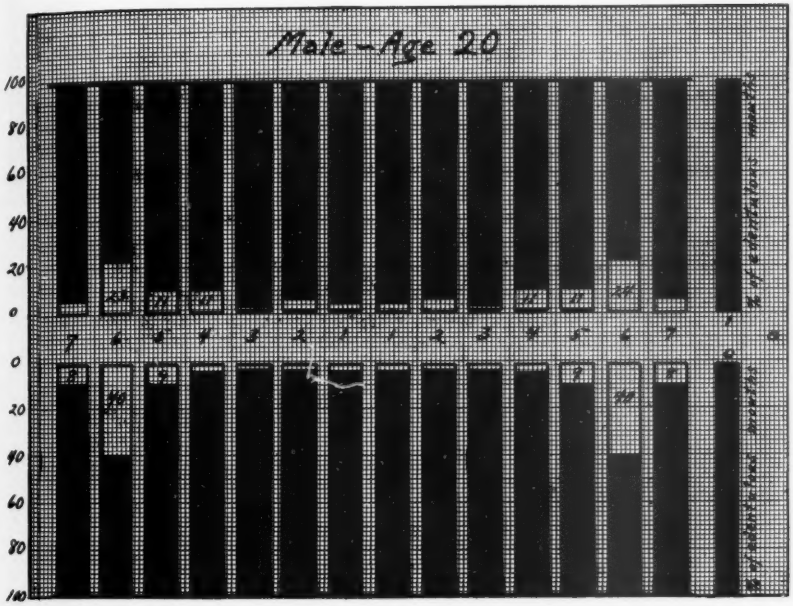
Male – Age 20
100
80
60
40
20
0
0
20
40
60
80
100

Fig. 9

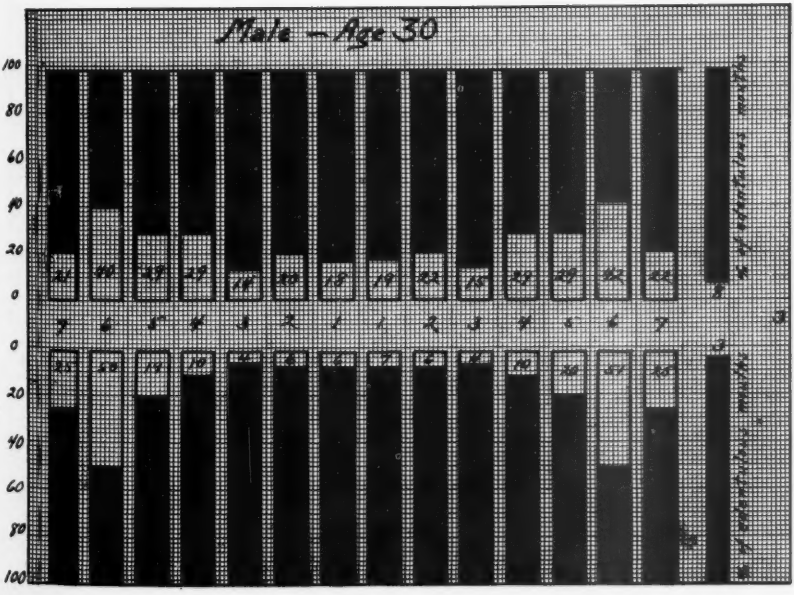
Male – Age 30
100
80
60
40
20
0
0
20
40
60
80
100

Fig. 10

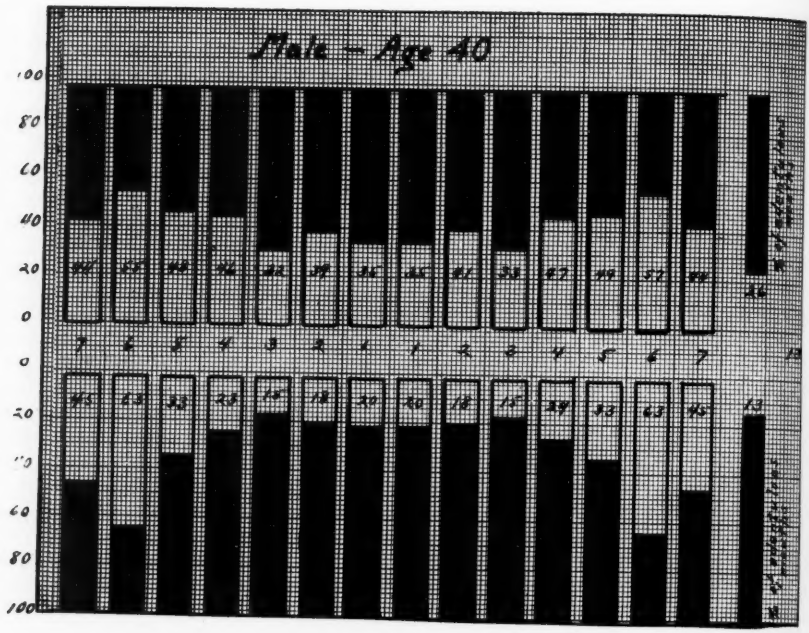
Male – Age 40
100
80
60
40
20
0
0
20
40
60
80
100

Fig. 11

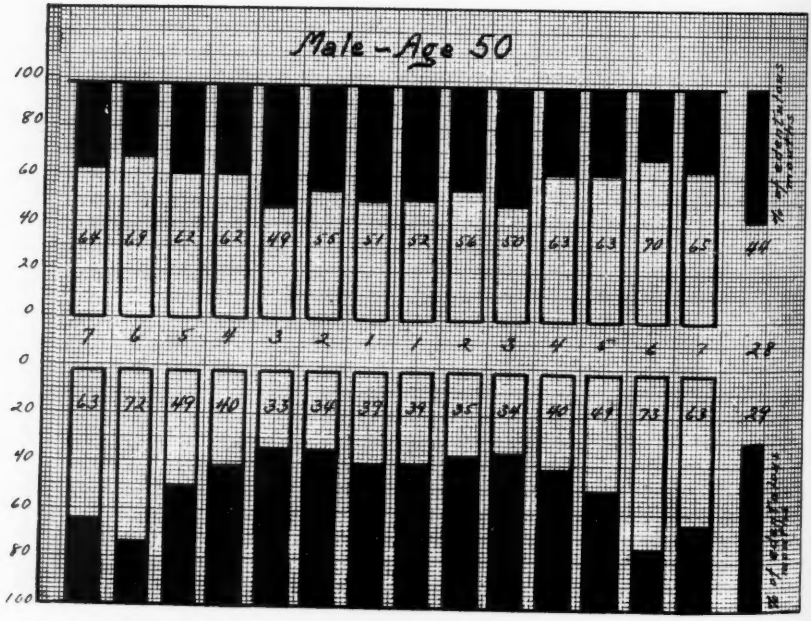
Male – Age 50
100
80
60
40
20
0
0
20
40
60
80
100

Fig. 12

not tell the whole truth is worthless from a scientific standpoint. The disappearance of the third molar and the lateral incisor would be an interesting study from an evolutionary point of view, and may be undertaken when means permit.

5. What percentage of patients come to the dental clinic for health reasons and not primarily for dental service? At what age do they come in greatest numbers, and is there sex difference here?

For the purpose of getting an answer

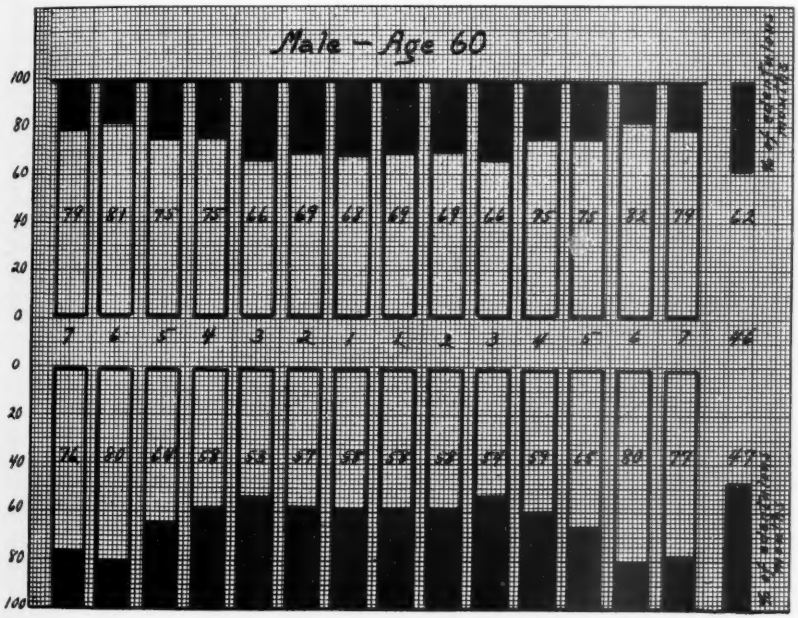

Fig. 13

The questions we raised were the following:

1. At what ratio are teeth lost?
2. At what ages do the losses take place?
3. Are there any sex differences in the matter of the loss of teeth?
4. What is the percentage of edentulous mouths at the different periods of life?

to queries 1, 2, 3 and 4, every tooth was studied individually on the right and left, above and below, for men and women separately. The findings were plotted on a five-year average from 10 to 75 years of age. This gives us fifty-six different graphs, twenty-eight for each sex.

From a comparative study of the graphs (Figs. 1-14), we find that the

lower first permanent molars are the first teeth to disappear. At the early age of 10, these teeth are lost in 10 per cent of boys and 15 per cent of girls. The increase in the rate of loss is very rapid. At the age of 15, we find a loss in 30 per cent of boys and 35 per cent of girls. At the age of 20, there is slightly higher. The difference was from 0.25 to 0.50 per cent higher for both upper and lower teeth, for men and women alike. The general average was almost exactly 0.33 per cent greater on the left than on the right side.

As to the comparative loss in male

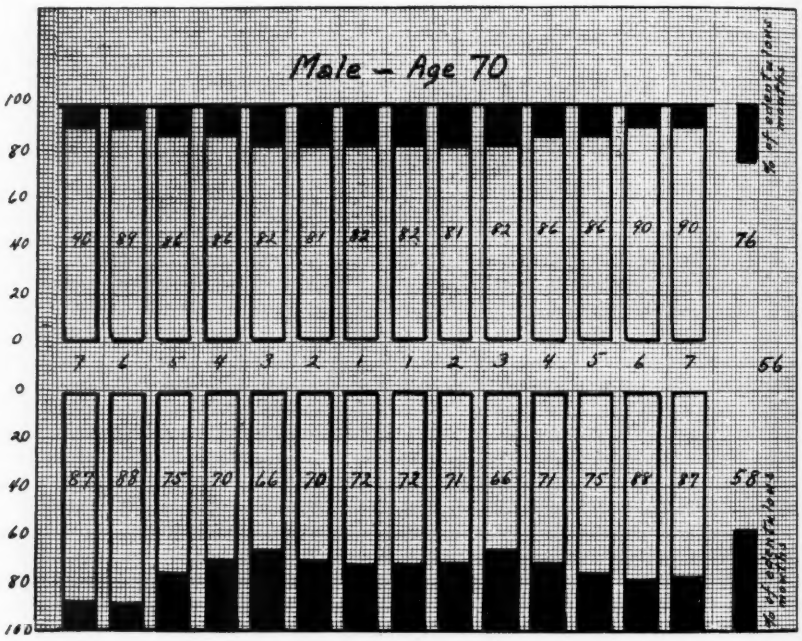

Fig. 14

loss of these teeth in 40 per cent of boys and 47 per cent of girls; and so on through the different periods. At the age of 40, the prime of life, 75 per cent of women have lost these teeth, and 63 per cent of men.

By totaling the actual percentage loss for all teeth, first on the left, then on the right, side of the mouth, it was found that the loss on the left side ran and female, we find little difference up to the age of 15 (with the exception of the lower first permanent molars), but after that point a marked difference begins to occur; and for any one of twenty-eight teeth, the loss for women increased from 10 to 15 per cent over that of men of the same age. The difference ran almost uniform for

the ages 30-60, after which the margin again narrowed. (Fig. 1.)

In our study of the edentulous mouths, we find a considerable difference between men and women, as shown in Table 2.

TABLE 2.—COMPARATIVE DATA ON EDENTULOUS MOUTHS FOR MEN AND WOMEN BETWEEN THE AGES OF 20 AND 70.

Men	Age	Women
1		0
——0		——0
0	20	0
8		20
——3		——8
3	30	8
26		43
——13		——20
13	40	21
44		60
——28		——39
29	50	40
62		73
——46		——55
47	60	57
76		86
——56		——76
58	70	78

PATIENTS SEEKING DENTAL SERVICE FOR HEALTH REASONS

The percentage of patients coming to the dental clinic primarily for reasons of health was almost nil up to the age of 20, but from 20 on, the numbers increased. At the age of 30, 15 per cent of our patients came to the dental clinic for reasons of general health. The peak is reached at the age of 50, 28 per cent coming for reasons of health. The percentage of women who came to the dental clinic because of poor health ran slightly higher than for men up to the age of 50, but from 50 to 70, just the reverse was true. This difference ran from 3 to 5 per cent up to the age of 50; thereafter, the figures were reversed. (Fig. 2.)

To further illustrate our findings, we have plotted the entire denture in six individual charts showing the loss of teeth at the ages 20, 30, 40, 50, 60 and 70 for men and women. The picture is by no means flattering to our profession. And when we are viewing the charts (Figs. 3-14) representing the age of 70, we are strongly reminded of the words of the prophet: "In the days when the keeper of the house shall tremble, and the strong men shall bow themselves, *and the grinders cease because they are few*, and those that look out of the windows be darkened." (Eccl. 12: 3)

CONCLUSION

By reviewing the table on the comparative loss of teeth, we find answers to questions 1, 2 and 3; but we note especially the early loss of the lower first permanent molar. We have called attention to the fact that this tooth is lost in 47 per cent of individuals at the age of 20, and what numbers are beyond repair at that age we may judge from its rapid disappearance during the following years. The factors responsible for the early loss of this tooth are many, but it is beyond the scope of this report to go into such detail. We do feel justified in calling attention to what takes place in the dental arches through the early loss of this tooth.

The lower first permanent molar is the first permanent tooth to erupt, and around it all the rest of the teeth are arranged. We may call it the keystone in the dental arch, although it is not placed in the center of the arch; probably, the foundation stone would be a better term. With the loss of this tooth, the development of the mandible is arrested, and the normal arrangement of the occlusal relation of the upper

and lower teeth is disturbed. The lower second molar is tipped mesiolingually. With a considerable loss of the supporting alveolar bone on the mesial root, commonly called the pyorrhea pocket, the lower third molar erupts with a contact at the distogingival third of the lower second molar. And no dental restoration, however skillfully constructed and scientifically placed, will repair this damage. Our plea should therefore be for the conservation of the first molars. How great a factor its loss is in the loss of the rest of the teeth is a matter of conjecture; but from general observations, we must conclude that it is very great.

As before stated, our findings are by no means flattering. At the age of 40, the prime of life, 26 per cent of our male patients have lost all the upper teeth, and 13 per cent all the lower. In women, the condition is still worse. We find 43 per cent edentulous in the upper and 21 per cent in the lower jaw. The condition of those who are still clinging to part of the teeth is not much better. In examining their mouths, we find a great many dental restorations that are doing everything but what they were intended for. We find disturbed occlusal relationship, broken down tooth crowns, lost or leaky fillings, lost contacts, gingival inflammation, disappearance of the alveolar bone, etc.; and when we do find what we like to call a normal healthy mouth, it is such an unusual treat that we call in the faculty and the whole student body to view it.

The question again comes up: Are we on the right track; and is this the best we can do?

A METHOD FOR CURING MANDIBULAR DEFICIENCIES BY PEDICLED GRAFTS FROM THE MANDIBLE ITSELF*

By HANS PICHLER, Vienna, Austria

DURING the war, it was necessary to operate in many cases of shot wounds of the mandible in which union of the bone fragments failed to result, either on account of the great loss of substance or of some mistake which had been made during treatment.

While transplantation of a piece from a remote bone is an excellent method, it is liable to fail in case of infection. It is not always easy to avoid this in the neighborhood of the mouth, and it is unavoidable in case of a focus of pyogenic bacteria enclosed somewhere in the bone or scar tissue and brought to life and activity by the operation.

Infection is far less dangerous if a piece of bone is used for grafting which is not entirely cut off from its blood supply, which is not only living tissue, but which will also remain living after being transplanted in its new place, because the flow of blood is maintained by a nourishing pedicle.

From this point of view, I have worked out a method of this kind during the war and have used it in about eighty cases with great success. My first patient was operated on in February, 1915. Bardenheuer and Krause published successful methods of the kind as early as 1893 and 1896. But they seem to have been almost forgotten. Surgeons of all countries would take pieces from a rib, from the tibia and later from the ilium. They seem to have been so much impressed by the more recent method of free transplantation from a remote bone, that they did not think of the older one.

This seems to have been the case in all countries. As far as I know, Dr. Esser from Holland was the only one who operated in a few cases following a similar principle. Foramitti (Vienna) used a part of the clavicle, which was first transplanted in the neck with a muscular pedicle, and in a second operation, with a new pedicle, in the gap of the lower jaw. I remember to have also read about a paper in the English language describing a similar method; but I could not get it at the time and I have lost track of it since.

I do not use skin as a part of the pedicle as Krause did, and I do not cut so deeply into the sound part of the

*Read before the Section on Maxillofacial Surgery and Surgical Prosthesis at the Seventh International Dental Congress, Philadelphia, Pa., Aug. 26, 1926.

bone as to get the mylohyoid muscle into the pedicle as Bardenheuer does. The muscles which are inserted at the chin, especially the anterior belly of the

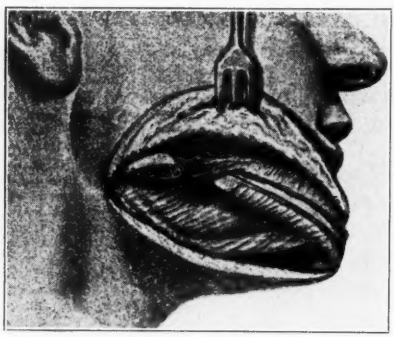

Fig. 1.—Incision illustrating method of operation.

digastric, lead a sufficient quantity of blood vessels to the bone to keep it well nourished. The bone graft will bleed nicely from its cut surface after being

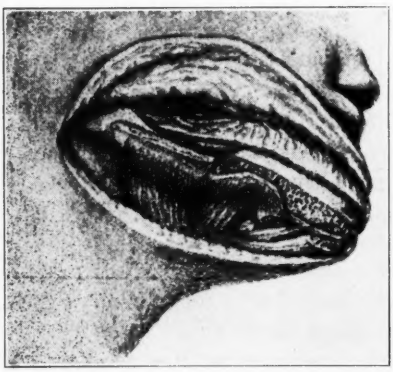

Fig. 2.—Incision illustrating method of operation.

sawed off and pulled backward to its new place of attachment.

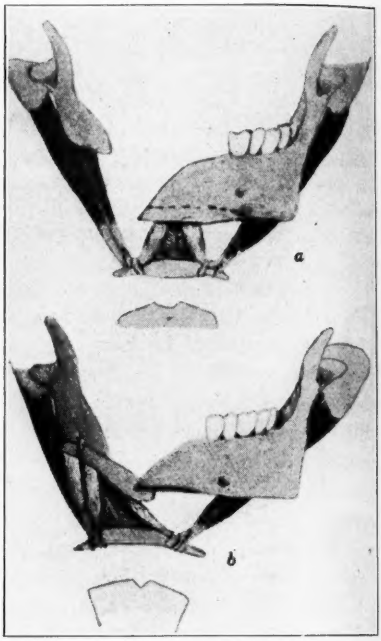

Fig. 3.—Grafts.

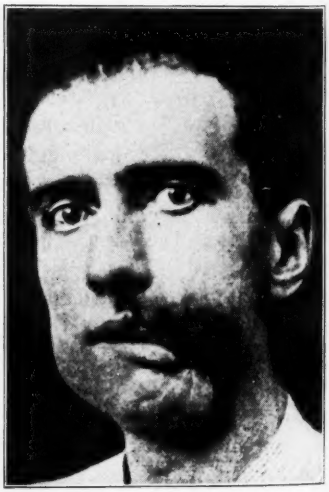

Fig. 4.—Patient after first healing of the wound.

My method is as follows (Figs. 1-2): An incision is made about 5 cm.

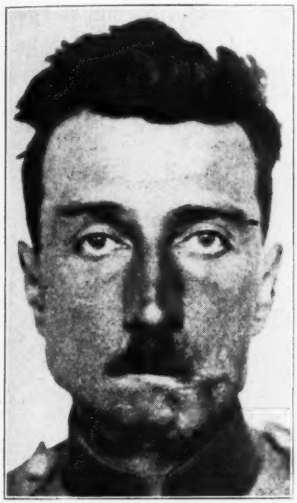

Fig. 5.—Patient after the lips and cheek were roughly reconstructed by plastic operation.

Fig. 6.—Appearance of graft after two weeks, it being attached across the defect with two wire ligatures.

Fig. 7.—Appearance of jaw, showing bony union, seven months later.

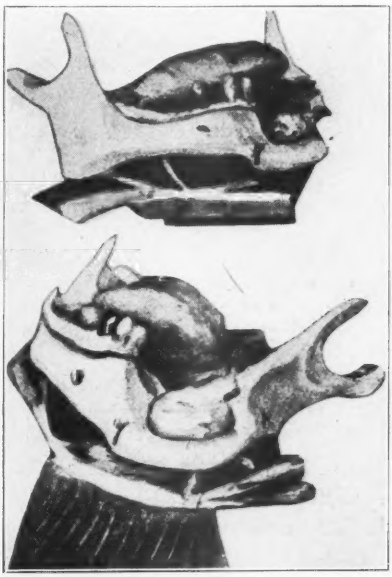

Fig. 8.—Painting of specimen, showing that the mandible is apparently approaching its normal shape.

distance from the lower border of the jaw and parallel to it and the skin is reflected upward, until a finger's width of its buccal surface is exposed, the platysma being left untouched. Then the ends of the bone are exposed and denuded of periosteum, and badly nourished scar tissue is excised. Great care should be taken not to cut into the oral cavity. Then the length of bone to be cut off from the mandible in front of the pseudarthrosis is determined. As a rule, the graft should not be put between the fragments but should be made much longer and bridged over the open space, overlapping both ends for several centimeters. The best part to use for a graft is the lower part of the chin, because here the muscles are well attached to the bone and connected with it by blood vessels which they have in common. An incision is then made through the periosteum (Fig. 2) about 1 cm. from the lower edge of the jaw, and the periosteum raised upward sufficiently to give room for the blade of a saw. A circular saw may be used, but as a rule a simple straight metacarpal saw will have access enough. The end of the graft is not made square, but gradually thins down to the margin of the jaw. (Fig. 3.) If necessary, the arch of the chin curvature and the whole length of the horizontal part of the jaw opposite the defect may be included.

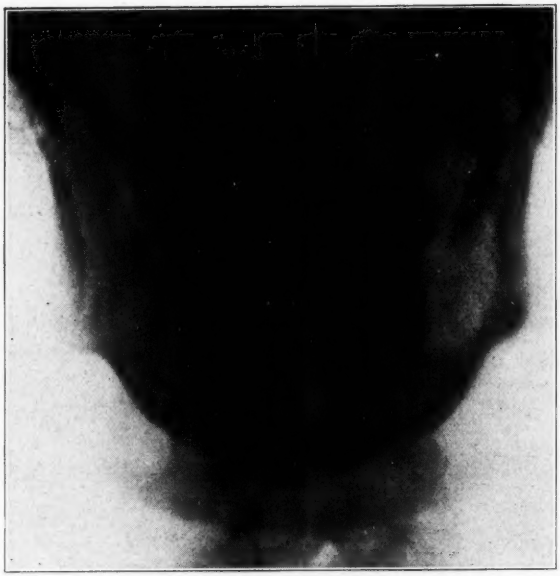

Fig. 9.—A case of cancer of the alveolar process of a man, aged 54. About the left angle of the lower jaw, the bone is destroyed to more than half its thickness.

When the cut is sufficiently deep, the graft may be pried off with a chisel. The lingual periosteum is then cut through and the muscles are divided and stretched with the fingers until the graft is sufficiently mobile to be pulled across the gap. Sometimes, the digastric muscle of the opposite side must be severed, if it cannot be extended sufficiently. (Fig. 2.) The digastric of the defect side is relaxed by the backward pull and may be mobilized further by cutting the connection of its tendon with the horn of the hyoid bone.

It is remarkable how nicely the curve of the chin part will give proper contour to the parts where the bone was missing. When the best position of the graft is found after some twisting and turning, the bones are freshened with a cutting forceps so that the cancellous bone is exposed at the surfaces to be united. In most cases, it will be well to cut a deep notch in the graft in which the chisel-like end of the anterior fragment is made to fit. This will take up most of the tension and prevent the graft from springing back toward its old position. The back end may be stuck in a hole or forklike incisura of the posterior fragment or adapted to it sideways. If necessary, a wire suture will secure its position. While I would not advocate wire ligatures in an operation of free grafting, they do not disturb the healing of a pedicled graft. In minor cases with slight tension, periosteal sutures, pref-

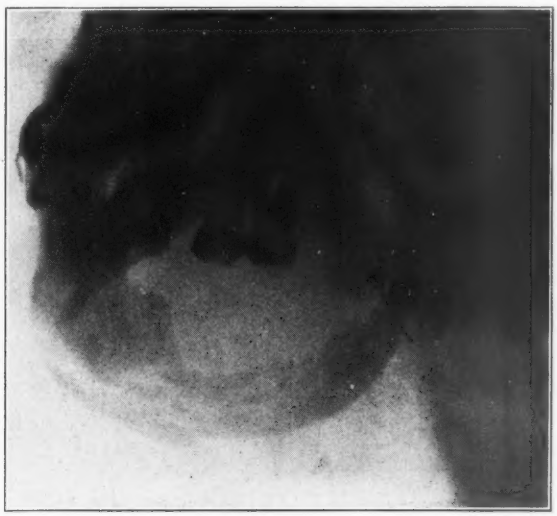

Fig. 10.—Appearance of jaw (Fig. 9) sixteen days after resection and immediate osteoplasty of the resulting defect by the method of the author. The graft from the chin region is fastened by a wire suture to the remains of the ascending ramus.

erably made of silk and catgut alternately, will be sufficient. By such sutures, further adaptation is secured and soft tissues are united, covering the lines of union and the cut surfaces of the bone as neatly as possible. Union of the skin completes the operation. In case of a small defect and slight displacement, a short graft may be interposed without twisting between the fragments, one end being stuck in a hole of one fragment, the other placed in a deep groove. Such a graft will stay securely in place without further aid. In major cases, the cut surface of the graft is usually more or less turned forward and toward the buccal side, its curve being downward and outward. Solid bony union usually takes place within a few months. A very instructive example of a typical case of this kind is the one illustrated in Figures 4-8. Figure 4 shows the patient after the first healing of his wound. Dislocation of the two fragments of his lower jaw had been prevented by a dental splint, made at the jaw hospital of Dr. Zilz, just behind the Austrian lines in Russia; but the mandible did not heal, because there was too great a loss of substance.

Figure 5 shows the patient after his lips and cheek were roughly reconstructed by plastic operation. Then the osteoplasty was made from the lower margin of the mandible in the chin region. Figure 6 shows the graft two weeks later, attached across the defect with two wire ligatures. In Figure 7, the solid bony union, seven months later, can be seen. The patient died three years later, a suicide, for some reason not connected with his mutilation. I had the opportunity to make a post-

Fig. 11.—Appearance of jaw (Fig. 9) sixteen days after resection and immediate osteoplasty of the resulting defect by the method of the author. (Compare Figure 10.)

mortem examination of the jaw and found the aluminum-bronze sutures healed into the bone without any signs of reaction. The graft was much thickened and rounded without definite demarcation against the bone of the neighborhood.

Figure 8 is made from a water-color painting of the specimen. The mandible seems to have been approaching more and more its normal shape.

The method seems to be far superior to free transplantation as regards the percentage of success. In about eighty cases, it failed but three times by suppuration and necrosis of the graft. These were very severe injuries, with extensive formation of badly nourished scar tissue around the defect. The two patients in which pseudarthrosis on one side of the graft resulted, though the wound had healed without complications, were both affected with chronic nephritis. One of them was healed by

Fig. 12.—Appearance of the jaw shown in Figures 10-11 two years after operation. Complete bony union had resulted at the anterior junction. At the junction of the graft with the ascending ramus, a small area of necrosis round the wire ligature had resulted in pseudarthrosis. A new operation one year after the first showed that there was no recurrence of the cancer and the pseudoarthrosis was cured by transplantation of a tiny graft from the tibis, which may be seen on the outside of the line of junction. Though the bone structure is not yet shown in the roentgenogram as homogenous and solidified, the bone was absolutely firm and rigid on palpation. There were no clinical signs of recurrence two and one half years after operation.

a second operation. Besides, three cases failed among five in which I had tried or pterygoid muscle, an experiment not to be recommended.

Fig. 13.—Appearance of the jaw shown in Figures 10-11 two years after operation. (Compare Figure 12.)

to use a graft from the posterior fragment with a pedicle from the masseter

This kind of osteoplasty is so reliable, even in the case of infection,

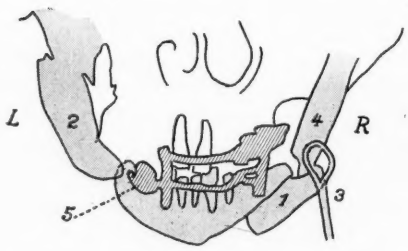

Fig. 14.—Method of uniting bone and graft. If the condyloid process is not destroyed, though it may be a pretty short piece of bone, it can easily be united to a graft of this kind.

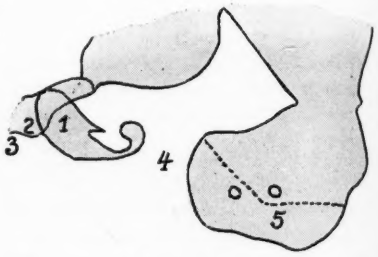

Fig. 15.—Method of uniting bone and graft. (Compare Figure 14.)

that I have used it in half a dozen cases with good results immediately

after removal of a cancerous section of the mandible. Bony union would result even when it was not possible to make a complete suture of the mucous membrane.

As an illustration of immediate grafting of this kind, I show the roentgenograms of a case of cancer of the mandible in Figures 9-13.

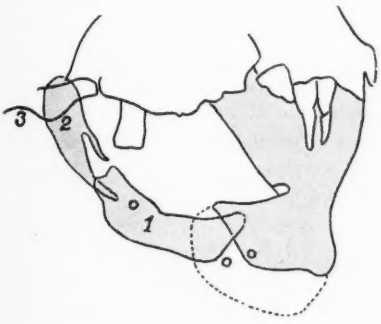

Fig. 16.—Method of uniting bone and graft. (Compare Figure 14.)

The method has its limits when there is not enough bone left in the middle part of the jaw from which to take the graft. It is not possible, for instance, to replace it by one half of the mandible or more. But if the condyloid process is not destroyed, though it may be a pretty short piece of bone,

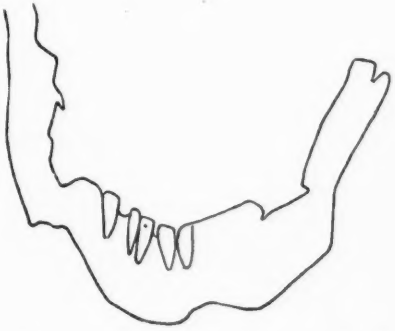

Fig. 17.—Method of uniting bone and graft. (Compare Figure 14.)

Fig. 18.—Appearance of patient before operation.

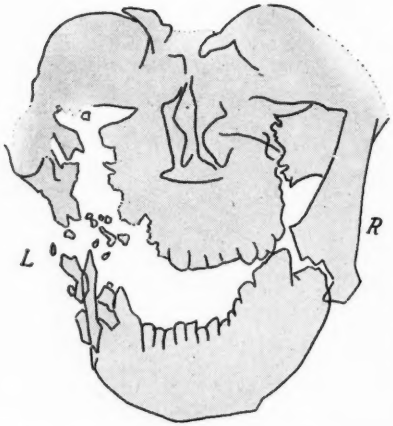

Fig. 19.—Drawing of jaw of patient shown in Figure 18.

it can easily be united to a graft of this kind (Figs. 14-17.) I have transplanted such grafts up to a length of from 10 to 12 cm. Figures 14-20 show a severe case of bilateral defect in which two grafts from the middle part of the jaw were used for a cure in two successive operations. One strip of bone from the chin part was used first for the right side, with the right digastric muscle as a pedicle. When this part was solidified, another strip of the bone overlapping into the defect from the first operation, with the left digastric as a pedicle, was used for the left side and united to the little spike projecting from the condyle.

Fig. 20.—Appearance of patient shown in Figure 18, after operation.

URGENT NECESSITY FOR AN INTERNATIONAL STOMATOLOGIC INDEX OF THE CURRENT PROFESSIONAL AND SCIENTIFIC LITERATURE*

By DR. ANDRES G. WEBER, Havana, Cuba

AT the Fifth International Dental Congress, held at Berlin in 1909, the late Gottlieb Port, of Heidelberg, delivered a most interesting paper on the subject with which we are going to deal: the urgent necessity for an international stomatologic index of the current professional and scientific literature. He justly divided the subject into two general and large parts. In the first, he endeavored to find the means of delivering to the professional man who wanted to study, as much as possible of the world's literature of our specialty and that of the medical and scientific, published not only in all possible periodicals, but also in all languages.

This part of the problem was ably solved, by Dr. Port, who insisted on the importance of initiating the publication of abstracts and reviews of papers, especially of the medical periodicals of the country, and translations of those in foreign periodicals of our specialty.

It is comprehensible that the professional man is a subscriber, at least, to the most important periodicals of his branch and also to one or more of the leading medical ones; but as he cannot receive, and much less can he read, a large number of the medical journals, it should be the duty of the dental journals to publish as many abstracts as possible of the papers in those journals that may interest them. This will not only increase the interest of its subscribers, but also will discharge an obligation of the editors who are guiding the profession in this most important postgraduate course, beginning when we commence practice and continuing during all our professional life.

It will also have a great educational value in enlarging the horizon of the reader. It is, in my opinion, useless to abstract, and more so to reprint, in any periodical, a paper published in our leading dental journals, which are undoubtedly received by the majority or probably the totality of the subscribers or readers. There are many good papers that will bear rereading, but it is waste of time to reprint them. It would be far better to reprint from a medical journal all the papers, or at least some paper, bearing on stomatology, bringing to our current literature and our dental journals, that part (and as much as

*Read before the Section on History, Science and Libraries at the Seventh International Dental Congress, Philadelphia, Pa., Aug. 25, 1926.

possible) which has been published in the general medical and scientific periodicals in a more attainable form and handy for ready reference.

The second part of Dr. Port's paper concerned the index.

As a primordial requisite, he established that an index should be divided into three principal divisions: (1) the description and title of each single paper (article), arranged according to subject matter: (2) an authors' register; (3) a cross-subject reference register.

We shall now endeavor to interpret his ideas and ideals.

1. The first division should contain:

(*a*) The author's name, and the city in which he resides, title of the paper in full, year, periodical and place of publication, volume number, pages (inclusive) and number of plates and figures or illustrations. When a discussion has followed the reading of a paper in a society's session, the pages also on which it appears should be included.

This part should then be arranged according to some of the classifications that are considered as standard, the old classic and scientific division according to those established in the medical branches, which is in general use and which was formerly used by the Index Medicus, published in Washington.

(*b*) The decimal classification system, which is an adaption of the one just mentioned, introducing numbers to facilitate the above.

(*c*) The alphabetical, which as its name indicates is ordered strictly in an alphabetical succession. This is being used in two different ways: (1) including only the subject contents, as, for instance, the actual Index Medicus, and doing away with the cross-index register,[1] (2) embracing in this alphabetical order, both the subject and the authors together and doing away with both the cross-subject and reference index and the general authors' division. This classification order is used by the Quarterly Cumulative Index of the American Medical Association of Chicago.

These last two, alphabetical, classifications may be adaptable or be found practical for the occasional reader, but it is by no means either scientific or convenient to the scholarly trained minds of investigators and learned men.

II. The second part is the authors' index or register.

This can be arranged according to one of the following four methods:

1. Author's name followed by complete title of paper, repeating year, periodical, city, volume number, pages, plates, illustrations, discussion, etc.; for example, the Black index.

2. If in the first or subject division, each subject card has been numbered consecutively, as for example the Port indexes, it would be a simple task to write the same number after the author's name, and if he has more, the number of papers, the different ones and as many numbers as he should have in the subject division.

3. If, in the subject division, each subject card has not been numbered consecutively, but numbered according

1. We have just been informed that the change of the classification from the subject to the alphabetical order of the Index Medicus was established on financial ground; it takes less space and is less expensive and is not considered as a standard or improvement.

to the decimal system, this gross number is written after the author's name. This system has, however, the inconvenience that, if an author has written several papers on the same subject, the finding of the others is a mere casuality, especially to that probably greater part of the consulting readers who, as a rule, are not accustomed to use the indexes. The following procedure could be adopted to avoid this inconvenience:

4. When, in the subject division, each subject card has not been numbered consecutively, it will be best to write after the author's name the page of the subject index in which the paper has been printed, without any reference to subject or decimal number classification. And if, in the same page, the name of the same author appears one or more times with more papers on the same or similar subjects, this page number should be repeated in the author's register as many times as they appear there.

III. The cross-subject-reference register is the most convenient and necessary part of an index and extends its usefulness to a considerable degree. In the Port index, this register has been admirably worked out. It can be adapted very easily when the subject division (1) has been numbered by the same system that has been described in the author's division (II), the number being written each time after the cross reference.

If no numbering has been used, the page number will be necessary, being repeated as many times as the subject cross indexed appears on that page. Although this numbering has not been adopted, it should be in the case of the strict alphabetical ordered indexes.

There have been several attempts to furnish the profession with an index of the current literature of our speciality. That there has always been a demand for this, we can judge by the history of this branch, both as to bibliography and as to index.

The bibliography is older, and we have been able to trace it as far back as Othone Brunsfelsii as at that time, and considerably afterwards, the books were the only literature available. With the advent of the periodicals, part of its contents crept in, and we find that M. Martini Lipenii tried to compile the papers published in the periodicals of his time. This author uses the subject-alphabetical order, and has at the end of the volume an authors' index.

Some years afterwards, D. Guilielmus Godofredus Ploucquet, began to publish his monumental work on bibliography and index. In this, we find several innovations which denote that Ploucquet had studied his subject thoroughly. As in all the previous works on bibliography, it is written in the Latin classic language of that age and the one we ought to adopt universally today. He uses the subject-alphabetical order in all his seventeen volumes published from 1793 to 1813. He included the books, academic dissertations and pamphlets and also the papers published in the medical and scientific periodicals, and to some extent he tried to index in part the contents of the books as far as they treated on several subjects. One noteworthy feature is that he introduces short commentaries in the form of notes, worded briefly in Latin, which implies that he had read practically all the works he had been able to

index. His work arouses the admiration of those that have studied it and have had to consult it often, and we feel this anew each time we have to consult his work. I find no better words in his praise than those of Christopher Johnston of Baltimore who said, in commenting on Kölliker's work: "He labors unceasingly and unobtrusively, and assures himself that he sees before he calls upon others to believe."

My opinion of him has already been stated in Black's index: *Maximi pretii homo, docta et laboriosa charta.*

We see therefore that, in the past, some efforts have been made to furnish the medical profession with both its bibliography and its index. It is hard to determine whether the bibliographers tendered the results of their studies to the profession, or whether their work was the final effort to supply the demand; but I consider that, although there was some demand for the publication of some sort of index, this demand must have been limited to the few. The general character of the bibliographic works, the purely scientific, both in character and subject matter, the details and the scholarly and masterly style of all the works prove that it was written for love of the work and that it was the desire of the writers to give to their colleagues the result of their labor, to aid them in avoiding the difficulties they had encountered in their search for some subject matter, giving them the entire result of their researches and studies.

Is there a necessity for an index of our current literature? Has there been such a necessity? There is and has always existed such a demand, both on the part of the writers of papers; the readers, who need or have always needed information; the teachers; the editors of periodicals, and the whole profession.

If we only go back to the time in which our journals were established, we find, in the very first number of the first dental periodical, the first bibliography published in a periodical. By whom was it issued? The editors. What does this mean? It means simply that those broadminded men, Eleazar Parmly, Elisha Baker and Solyman Brown, were trying to initiate their readers into studying the subjects "to assure themselves what they *can* see." It means also that, being conscious of the responsibility vested in them, they were trying to establish the foundation of our literature on solid grounds.

Was there a demand? Probably, there was, but more surely they anticipated themselves in offering the base upon which knowledge could be firmly built, at the same time establishing a demand for rational and scientific works. It was a logical step.

The dental societies contributed their part, and they also fostered, from the beginning, the establishment of these lists of references. We find that the American Society of Dental Surgeons appointed Robert Arthur, the first graduate of the Baltimore College of Dental Surgeons, to furnish a report on dental literature, which is a bibliography and a list of the periodicals published then.

All the reports of that date describe only the books and the periodicals without mentioning the contents of the latter. Even such an able writer as C. P. Fitch, in his report, which is a model

of learning, begins with a paper on the history of our literature, by no means what we today understand to be such a report, going into no details. The same can be said of nearly all reports of that time. These reports were made by men of notoriety then, whom we still recognize: McQuillen, Bogue, Cushing and Dean, the report of the last one named, for example, is what we term a *censura* or what is commonly called a bibliography or review of books. He reviews the book, criticizing and analyzing its contents, and speaks in general terms of the periodicals, but does not mention the separate articles or papers, nor name authors or give titles of papers.

These reports have been continued and are yet furnished to the profession, naturally nowadays in a strictly scientific style; for not only are they classified according to subject matter, but also with short commentaries, which enhance their value. They are also, as formerly, reports for societies, and also, as formerly, are entrusted to men versed in our literature; e. g., Anthony, whose reports appear nearly every year in the *Dental Cosmos*.

In their kind, they are of utmost value and fill a need which must be kept before the profession.

These reports are, of course, limited, containing only the principal original papers. The number of periodicals are also restricted to the principal ones, and in no way try to be exhaustible or complete. They take in consideration only the papers published in the periodicals, mostly the more important ones, and in no way try to make a complete report, and less, an index. In the journals, the bibliographies or reviews of the recently published books, the reports are meager; for we hear only of a few books in the statistical tables which we present at the Scientific Exhibition. We see that, in the decade 1900-1909, 1,934 books were published; in the next decade, 1910-1919, the number was 1,895, and in the present decade beginning in 1920, there have already been 1,145 published. This means that the majority, not to say the totality of the profession, ignore the fact that they have at their command such a vast amount of work which they could consult. Would it not be proper that the profession at least know, the authors and titles of these books or works? We see that the books increase in number from year to year and will probably continue to do so. If we do not begin to record them now, when will we do it? Shall we allow them to be lost? Is it not an act of justice toward the authors to record their efforts and works?

If we do not lay before the profession the books that are published, how can they know that they exist? But if we inform them now and again, would we not educate them, open their eyes and teach them to read? If the average man sees every day an index of papers published in a logical order, will he not, little by little, be interested and endeavor to read some special paper because the subject has been called to his attention, or it was written by some of his friends or by a man whom he admires? And if we list books in that index, will he not try to obtain some of them? We can create that demand only by publicity, to the benefit of the authors, and the editors or publishers will thank us.

Now we come to the most important part: Is there a need for an index? Is the time ripe for such an enterprise?

In reading our literature, we see extremists at both ends. I do not want to condemn extremists. By no means, as

I believe that they are sometimes necessary.

Years ago, (1909) Dr. Mayrhofer of Innsbruck, writing on the literature and its needs, says, although he is not of that opinion, that there is a complaint that too much is being written. And now we come to the year 1918, and one of our ablest men, an expert in literature, L. Pierce Anthony says: "The dental profession has long borne the stigma of being a nonreading profession." This we have read untold times, for it has been repeated quite often.

Now, how can we harmonize these two contradictory opinions so as to arrive at the truth? If too much is written, we can infer that there must be plenty of readers; or if there are no readers, why is so much written? And we must wonder, where does all this reading matter go? At the moment that its publication is accepted and is continued in an increased way, it must be because there is a demand.

As soon as the professional man finishes his courses at the university, the most serious and profound part of his studies begins. Be he of studious or of practical inclination, as he probably has plenty of leisure time, he employs, or should do so, part of this unoccupied time in reading. He will probably subscribe to a couple of magazines, buy now and then some books, probably will go also to the reading room of his local society, where he will find several current periodicals and, on the shelves of the library, the back volumes of those journals, and probably the complete files of the most valuable and important ones.

After a few years, one day he reads a paper that treats a scientific subject, or if he is only a practitioner, on some technical method, he suddenly recollects another article, which previously had impressed him, does not, however, remember the journal, year or volume, goes to his bookcase and tries to hunt it up in the indexes of the periodicals that he receives, and not finding it, thinks that it was in the library of the society. Going there, he finds himself perplexed before its shelves full of files of different periodicals and books. There are only two solutions of this problem: either he loses a great deal of time in his search until he finally finds what he seeks or else, at the magnitude of the task before him, hopeless he gives it up.

If he is consulting or reading the books in the library of his society, the librarian comes to his aid, but as he is probably an honorary librarian, the chances are that he does only amateur work and his aid will be limited.

In the universities and in the libraries, if a trained librarian is employed, his duty is to furnish the petitioner with the complete information required. But how will he be able to satisfy this demand? He has no current index; he has no means to furnish the required references promptly. He must hunt them up, which requires time. There are not many librarians who can furnish references in different languages. So the need of the current index is felt by both parties.

This problem must be solved by all concerned. On one side, there are several different needs: The needs of the practitioner, who is in the majority, his demands being for the greater part of empiric character; the needs of scholars and of investigators, which is of the highest character possible; the needs of the periodicals themselves, represented by the editors; the needs of the professors at the dental schools,

and the needs of the students at those schools; and finally the needs of the librarian in those schools and in the association and society libraries. To this, it might not be amiss to add the needs of the odontologic associations and societies, as an entity, in the private capacity and in meeting the demand of their associates or members.

We can presume that the editors are probably the ones that are most in need of all kind of indexes, containing the past, the current and, if possible, the future literature, so we must conclude that they should be the most interested in the solution of this problem and also should be the first to find help to the ways and means towards this end. The first index of the periodical literature of our specialty was published by Taft, after he had held the position of editor for forty years.

The general practitioner needs to know the literature on general practice, which is quite distinct from the material required by the scholar or investigator. Here, we need a cooperative working scheme. The man that cannot do experimental work needs the investigator, and the investigator will find some use of the "practical cases" even if they have been done with "scientific" empiricism, as he can obtain from them, according to Heinemann, the guide which may conduct him to a path that will avoid the errors ahead.

We have to consider the different kinds of demands that this index will have to cover. The majority of the readers wish to have at hand the literature that they desire to consult. Perhaps, they are in no mood to hunt it up, or it might be that they have no practice in searching for it. Perhaps they have looked for it before, and after searching through a dozen volumes, have not been able to find it. For the past literature, this problem has been solved through diverse indexes that have been published, but, for the current publications, there is no guide, so they desire this service. According to statistics recently published by Villain and Friteau of Paris, there are 129,145 dentists in the world. Supposing that only 25 per cent should be interested in references or be of studious habits, that would mean that at least a number equal to the total number of members of our American Dental Association would be benefited by the establishment of a current international index. Except the de Terra index, all indexes published have been one-sided. That means that they have been compiled to meet only the demand of one country or of the dentists speaking only one language, but nowadays neither the sciences nor the professions, and less the educated, are content within such narrow confines, and this gathering of international character denotes that there is a need for the most complete records available. We see that the largest number of those gathered here command several languages, and probably the rest are accustomed also to read in various languages; therefore need a complete compilation of all that has been or is being written. An index to cover the wants of all concerned must include the whole output of the writings not only in all possible languages, in odontologic periodicals, but also including the stomatologic and odontologic writings in the medical, scientific and natural history journals. Further, we need complete information regarding the books and their different editions, and the new periodicals that are founded almost daily, and all matters that pertain to our profession.

According to this idea, we have established our studies of our literature and have divided our work, as you will be able to see and judge in the exhibition annex to this Congress.

I. The bibliography and biblioiconography of stomatology. This comprises the description of all published works in the form of books, academic inaugural dissertations or theses, and pamphlets issued as original works by the authors. Their bibliographic reviews and references comprise 14,887 works, from 1483 to 1926.

II. The bibliography of the odontologic periodicals, transactions, etc., from 1839 to 1926.

III. Index Stomatologicus. This index comprises 1,000,000 classified cards in thirty general subject divisions and more than 10,000 subject subdivisions, with an exhaustive cross reference, having sufficient material for nearly half a million cards, part of which are already prepared. This index comprises the papers published in periodicals, odontologic, medical, natural history, scientific, etc., beginning in 1483, up to the present year.

IV. Iconography of dentists and also authors, original engravings, copper plates, etc., beginning in 1692.

V. Iconography of engravings of the dentist in history, caricatures, oil paintings, copper plates, mezzotints, wood, etchings, etc., from oil originals by famous artists; beginning in 1488.

VI. Iconography of Saint Apollonia, comprising handpainted minatures on pergament in prayer books, Horae beatae Virginis, handpainted wood engravings on lives of Saints from *Incunabulae*, copper plates on pergament paper, etc., wood, etchings, etc., beginning in the fourteenth century (1350).

All the different parts of this work are accompanied by photographic reproductions.

As you will see, it embraces the whole literature, which has been subdivided so as to facilitate its study; but as we are dealing now only with the index, I shall refer only to this part which comprises paragraph III. Of course, for an index of the current literature, the number of the divisions would be proper, but the subdivisions would be too elaborate, as it would take too much space, which would not be covered by the number of papers belonging to each one of those subdivisions. Even the decimal classification worked out by Huet would also be too extensive, so we would have to reduce the number of subdivisions, and this defect could be compensated with a proper cross-reference register, to make the work more adaptable to those not accustomed to research, or who do not understand the distribution. An adaptation of the Black index, which is admirable, would be quite proper with modification now and then, for science is advancing. Maybe, the Port and de Terra combined, and Huet's would give us the clew, for we have also to consider the needs on an international scale.

On the other hand, who is going to try to satisfy this demand in its varieties of forms? In the first place, those concerned, and the bibliographer.

The profession at large must furnish the funds, the scholars and investigators must add to this also their personal contributions and publications in the form of books, pamphlets, reprints and periodicals, as must editors also, who can supply funds and material with their journals and reprints.

Scholars can furnish funds, as can professors as they are scholars and investigators. The librarians can furnish material, and the associations and societies, funds and their publications, transactions, etc.

If we study this problem from an American point of view alone, financially we must depend on the organized profession at large, the associations, the state societies and the local or constituent societies, the teachers' association and the teachers, the periodicals themselves and their editors, the dental schools and perhaps their students, and the libraries. So we have about ten different groups. Of these, we can count on the organized portion alone.

As I said before, the number of members of the dental profession has recently been calculated as 130,000, but the number of those that are organized has not been calculated. If we start with the patron of this congress, the American Dental Association, we see that over one-fourth of this number are already organized. And as the old index bureau of Pittsburgh taxed the dental schools on their total number of students for publication of Black's index, we could, for instance, tax the American Dental Association; this association levy an extra tax on the component state associations; these in their turn, contribute with an equal proportional sum, and also levy a new extra tax on component local societies, which would then triplicate the original sum, and if these local societies could further persuade the component members to contribute the same amount, we have quadruplicated the original amount, and then reached a sum equal to that which could be obtained from the profession of the whole world. The American Dental Association could reach the rest of the organized part of the profession: the teachers, the schools, the periodicals, the libraries. And then only a few cents per capita would suffice.

Starting with the American Dental Association and through and under its auspices, the rest of organized dental associations could be reached and the establishment of an international stomatologic index could be founded on solid bases.

This financial part of the problem, although a costly proposition, would be solved satisfactorily. It interests the profession of the whole world, and if each one of these parties contribute according to their capacity, solution of the financial problem would be an easy matter.

This section should vote a resolution to the Congress for the establishment of this index we need, and the Seventh International Dental Congress would be gratified to see this index started under the auspices of the American Dental Association.

As has been said, the ideal would be the establishment of an index bureau for the past and for the current literature, for instance, our personal index, to be at the disposition of the profession. For the past, we have given freely and cheerfully lists of references to our friends and to all the colleagues that have asked for it, and are willing to continue to do so, when the consultant asks for a specific line of references, as for instance: the complete literature on a subject, or the references in one or several determined periodicals, in a determined year or years, in all languages, in one or several languages, the writings of one author, those of one

author in one language or in certain languages, etc. And it would be convenient to state for what purposes he desires it; for instance, investigation purposes, be it in anatomy, histology, embryology, physiology, etc; for history; for teaching purposes; for statistics; for practical use, etc.

As a professor delivers to a student the material he has to study in an orderly, rational, scientific and logical form, the bibliographer should be able to meet the demands of his "student" in the same scientific manner. Not until the science of bibliography has been founded on these bases, can the researcher fully be satisfied. It is more important, we believe that, in all universities, a chair on dental bibliography and history be established, for bibliographers would be the greatest collaborators of the whole teaching staff.

If the teachers fulfil their duties in a conscientious way and desire to cover their lectures in the fullest sense, they must have at their command all the means avaliable to that end, and then the bibliographer, whose duty is to be in contact with the whole and is in position to furnish it, could be considered as the teacher of teachers.

PERIODONTOCLASIA: ITS SIGNIFICANCE IN THE FIELD OF PARTIAL RESTORATION*

By PAUL R. STILLMAN, D.D.S., F.A.C.D., F.A.A.P., New York City

PERIODONTISTS have long been conscious of the close relationship between the problems existing in their field, and those in the field of the partial denture worker, but they have hesitated to intrude themselves into the councils of the older branch of practice.

Every partial restoration, whether it is a one-tooth bridge or an extensive partial denture, depends for its ultimate success on the health and integrity of the periodontal tissues of all the remaining natural teeth in the mouth. In the case of the short or one-tooth bridge, the insistence on complete periodontal health may not be obvious at first thought. Consider, however, that the loss of any tooth in a mouth already supplied with a bridge, whether it is an abutment of that bridge or not, necessitates either the making of a new bridge, or the remaking of the old one. This constitutes failure for the prosthetist, assuming, of course, that it is not directly chargeable to the neglect of the patient. Far too many failures of this type are recorded in the dental offices of this land. Patients come to their dentist regularly and at such intervals as he requests. They give to their mouths the home care prescribed by the dentist; yet many of these patients, because of the encroachments of periodontal disease, are the subject of a more or less continuous bridge and denture building program.

*Read before the Section on Partial Denture Prosthesis at the Sixty-Ninth Annual Session of the American Dental Association, Detroit, Mich., Oct. 25, 1927.

What are the requirements for periodontal health for mouths requiring partial restorations? These requirements are essentially the same in all cases, whether one tooth is to be supplied or the case is one approaching the edentulous; or the mouth has thirty-two perfectly healthy teeth. The prosthetist must accomplish happy results for his patients. His problem is to produce an appliance which will coordinate and synchronize mechanically with all the remaining teeth in that mouth.

First comes the matter of occlusion. Traumatic occlusion is a source of injury in mouths containing thirty-two teeth, but it becomes more menacing when the number of teeth becomes diminished, and this is true especially when artificial structures are introduced. The time was when the occlusion on a bridge was set up on any sort of articulator and an occlusion contrived which was subservient, first, to the esthetic requirements, and, secondly, to the requirement of function. The order of these requirements should be reversed. Esthetics is important, but it will always remain of secondary importance. Too frequently, in restorations, the result has been that abutment teeth were literally driven out of their sockets because of a weakness in technic as regards coordination. Until the effect of traumatic occlusion was recognized by periodontists, and presented to the profession as the principal cause of loosening of the teeth, the prosthetist failed to realize the source of his troubles. With this realization, there began a period of increasing attention to occlusion. At first, the concern was solely with regard to equalizing the stresses of the occlusion of the bridge itself. An improvement was at once manifested; that is to say, the bridge abutments were found to be less susceptible to periodontal disease than had formerly been the case.

In a certain number of cases, the end results were not entirely satisfactory. It was found that there was still a shortcoming from the occlusional standpoint. Moreover, in many of these cases, other teeth than abutment roots developed periodontal disease, with the result that other and more extensive bridgework was ultimately required. The logical thing, of course, was to secure what is now known as balanced occlusion throughout the mouth, irrespective of the extent of the original bridge. One step further remained to be taken, and that was to secure this balanced occlusion of the natural teeth before any restorative work was undertaken. In other words, all the teeth remaining in the mouth were ground to a functional occlusion before "the bite" was taken. When this procedure was adopted by the brighter and more receptive prosthetists, the problem of traumatic occlusion due to bridgework was practically solved.

It is generally accepted, at the present day, that balanced occlusion is a prerequisite for success in full denture work. I refer you to any specialist who practices this branch of dental science. It is also recognized that this same functional balance is necessary for success in the treatment of periodontal disease, even where the element of restoration is not a factor. I believe that there can be no argument, then, against making this routine practice also a requisite in the field of partial restoration. While this proposition may be accepted in theory, it is not always easy to satisfy oneself that it should be made a universal practice in mouths which, at the time of restoration, ap-

pear to be in a state of health. We must realize that even when there has been no previous periodontal disease, the insertion into the mouth of an artificial substitute for the lost teeth at once imposes an unnatural environmental burden on the abutment teeth. Natural dentures which might tolerate a slight incoordination of their occlusal surfaces are thus put at a decided disadvantage through the insertion of a bridge. Unless correct attention is given to this, disease will surely follow.

An instance may serve to illustrate my point. One of the most frequent offenders in the mouth, from the standpoint of occlusion, is the upper cuspid. This tooth, which is often called on to support a fixed or removable bridge, because of lack of natural wear is often found to be out of occlusal harmony with the rest of the denture as regards its length and the inclination of the plane of its lingual surface. It is seen to be displaced slightly when the teeth are brought together in occlusal contact. The tooth is observed to be slightly loose. Prosthetists, in the past, have failed to note this incoordination. Three-quarter crowns, or other retaining devices, have been placed in such a manner as to accentuate and perpetuate the original unfortunate relation of this tooth with its antagonist. Thus, the bridge begins to function with a definite traumatic occlusion, involving at least one of its abutments. The result is familiar to all of you: gingival congestion, loosening of the tooth, chronic local uncleanliness, gingivitis, development of a pus pocket, etc. In other words, the same inevitable sequelae as that which precedes the loss of almost any tooth through the ravages of periodontoclasia. When the periodontist sees such a case as this, he finds it necessary, in order to restore health, to remodel the offended member and the antagonizing teeth. This quite often results in the destruction of one abutment of what might have otherwise been a satisfactory bridge.

I think it is hardly necessary, at this stage in the development of our profession, to more than call attention to the basic character of the injurious agency that I have described, or to remind you that treatment of periodontal disease, in such a case, can only be successful when it includes the relief of traumatic occlusion, irrespective of what the feelings of the prosthetist and the patient may be.

Another type of case, which is also quite common, is to be found in a mouth in which drifting of the teeth has developed after extraction, with inharmonious occlusal wear on teeth not immediately adjacent to the missing ones. In such a mouth, signs of incipient disease are usually to be found, but these may easily escape detection by the untrained eye. Here, again, the placing of a bridge not only perpetuates the occlusal disharmony but also actually accentuates it, with the result that what were only incipient signs rapidly develop into easily recognized symptoms of established periodontal disease. Yet the occlusion of the bridge itself may have been quite innocuous as far as its own occlusal relationship was concerned.

It is not necessary to enumerate more of the many examples of conditions in which traumatic occlusion may be present at the time when bridgework is begun. Doubtless as I speak, many clinical pictures of cases falling in this category are passing before your mental

vision. You have all seen them. I merely wish to present to you as clearly as I am able the simple proposition that balancing of the occlusion before undertaking the construction of a partial restoration is a vital step in correct partial denture procedure.

It should be unnecessary for me to dwell on the occlusal requirements of the supplied teeth. Yet the periodontist is quite frequently called on to treat disease in a mouth in which painstaking prosthetic work has been done, only to find that much of the disease is due to an occlusal incoordination induced by the restoration work itself. One of the commonest errors is committed for the sole purpose of satisfying what appears to the operator to be esthetic requirements. The facings of an upper posterior bridge, for instance, are quite often given an extreme overbite in their relations with the lower bicuspids or molars. This, at times, produces a pretty effect, but usually with the result that there is decided functional interference with the lateral movement of the jaw. A case such as this is usually complicated by a previous closing up of the bite, due to several extractions or to extreme wear of the posterior teeth. Artificial teeth can be happily inserted and retained only when the accomplishment of occlusal balance such as I have mentioned is adopted. Where this latter condition prevails, as described in the preceding case, the only hopeful procedure under certain circumstances is the "opening of the bite." This operation should be preceded by modification of the length of the anterior teeth, which usually give the impression of being elongated, owing, usually, to an absence of incisal wear. After they have been sufficiently shortened, the molars and bicuspids are then built up so that they will coordinate with the modified anteriors. Whether this extensive program is required or not, or is actually advisable, let me urge that extreme care be used in setting up the porcelain facings for the posterior pontics, so that they shall coordinate and not cause interference with the lateral mandibular movements.

In this connection, it may be well to call attention to a commonly accepted practice among prosthetists with reference to the reproduction of cusp form. It has been stated that cusps of supplied teeth should follow the type of cusp found in the mouth in which they are to be placed. I think that this theory is sound. But, because of its very plausibility, it has led many earnest workers astray. In the first place, it is easy to apply the theory incorrectly, with the result that the cusps do not actually harmonize with the occluding cusps of the antagonizing teeth in the mouth. Frequently, antagonizing teeth are found to be actually deformed. One should not accept deformed antagonizing teeth. The possibility that the natural cusps are incapable of providing a coordinated occlusion for any artificial appliance places a technical hazard on all bridge workers. These natural teeth are frequently found to be so deformed that there is no possibility of functional harmony. To build cusps which will harmonize with these inharmoniously formed structures will only magnify the difficulties of the problem.

Another manifestation of this error is the effort which is quite often made to build in the mouth of a middle aged patient cusps which have the pronounced outlines and inclination of youth. This,

of course, is absurd. Even when fine esthetic harmony is provided in such a case, damage will inevitably be done through the imposition of an intolerable strain on the periodontal structures. Here, modification of cusp form should include the occlusal surfaces not only of the pontics, but also of all the abutment teeth which may show lack of compensating functional wear. This program should also include modification of the deformity of all other cusps in the mouth. And this brings us naturally back to the earlier statement, that balancing of the occlusion throughout the mouth should be performed previous to the beginning of bridge construction.

When bridges, or partial dentures, are required, it frequently happens that those teeth adjacent to the edentulous spaces, which would naturally be used for abutments, have drifted somewhat from their original position. This is almost invariably accompanied by a tipping of the tooth. In other cases, the tooth may have erupted in a grotesque position; it may be tilted buccally or lingually, or even mesially or distally. In such cases, occlusal stress is in a direction divergent from the long axis of the tooth. This all too frequently results in traumatic occlusion, and its inevitable sequel, periodontal disease, even if no restoration is placed in the mouth. To utilize such a tooth as an abutment, or anchorage, adds to this burden, and cases so managed will almost invariably terminate in the loss of the tooth, and also the failure of the restoration. Such teeth are congenital cripples and, if used at all, should be employed only with the understanding of the patient that long service for such a bridge is uncertain.

One of the most serious aspects of traumatic occlusion is that phase induced by lateral stress. Such stress is produced by the interaction of the cusps of the upper and lower teeth in their lateral gliding contacts. Cusp gliding is normal in the natural denture and should be tolerated when all of the teeth are *in situ;* but, after one or more teeth are lost, and these are replaced by artificial substitutes, the teeth used for anchorage must support not only their own lateral stress, but also that of the supplied teeth as well. This additional burden of lateral stress may easily prove intolerable to the supporting tissues of the root. To bring such a condition within physiologic bounds usually requires the modification of cusp height on both the abutment and the supplied teeth. Where such teeth are found to have already exhibited symptoms of periodontal disease, the cusps should be even more definitely modified. For purposes of better stabilization, it is advisable to employ supplementary anchorage on available teeth elsewhere in the mouth.

In recent years, there has been advocated the practice of "opening the bite," in cases in which malocclusion has produced a deformity of the dentures, the correction of which suggests this remedy. This solution of the problem is frequently acceptable and occasionally successful; but it must be remembered that the opening of the bite involves the building up of natural teeth, with consequent lengthening of the clinical crowns. This increases the leverage on the root, which cannot itself be correspondingly lengthened. This procedure inevitably produces some degree of incoordination, and traumatic occlusion may be the result. If the root is long, and well supported by

alveolar bone, no harm may follow, but if alveolar resorption has already begun, the building up process of the opening of the bite will produce or accentuate a traumatic occlusion. This occasionally results in failure, no matter how perfectly the occlusion of the case is balanced. As a general rule, it is safer, when teeth exhibit alveolar resorption, not to "open the bite."

CONCLUSION

It is but natural that the periodontist should see traumatic occlusion as the outstanding issue in partial restorations. My observations are founded not only on a study of this pathogenic agency as I see it day after day in cases of periodontal disease, but also on the observation of cases which have developed this type of disease around the abutments of bridge and partial dentures. I have saved many such appliances from premature loss by the correction of this condition. Furthermore, I have seen many appliances whose success could be clearly traced to the intelligent management of the occlusion throughout the mouth. Experience, backed by careful observation, is a teacher whose value cannot be gainsaid.

DISCUSSION

Clarence B. Vaughan, Boston, Mass.: All who are interested in periodontia are particularly interested in those cases of periodontal disease in which bridgework is involved. American dentistry has long been noted for its achievements in the field of restoration. But American dentists have come to realize that their own achievements had serious shortcomings. The source of the difficulties has been sought long and earnestly; it has remained, in my estimation, for the periodontist to put his finger on the sore spot. This is the matter of traumatic occlusion. It may be well at the outset to defend the practice of grinding the teeth, as this has been attacked in some quarters. We should always keep in mind that this grinding, when properly performed, is simply producing, by artificial means, a wear of the teeth which should, under normal usage, be produced naturally by the patient. I have invariably found that where such wear does not occur, periodontal disease, or some equally serious disturbance, will supervene. And as Dr. Stillman has pointed out, when some of the natural teeth have been lost, and are supplied by artificial substitutes, these unfortunate conditions are accentuated. To correct traumatic occlusion becomes, therefore, one of the first duties of the dentist who would construct a partial restoration. Dr. Stillman has advocated a procedure which will come as a new thing to many, even those who have been correcting traumatic occlusion in their bridgework cases; that is, the correction or balancing of the occlusion preceding any steps in the construction of the bridge. We have come to accept quite generally the performance of this operation, but have usually reserved it for the later stages of the restoration program. Furthermore, I think that few dentists balance the occlusion in their bridgework cases unless there is evidence of fairly well developed periodontal disease in the mouth. Let me first urge on all, the correction of traumatic occlusion or what we might also call cusp incoordination in every case in which a partial restoration is made, whether pronounced disease is in evidence or not. It is but a logical development of this same idea to advocate the balancing of the occlusion as the first step in the bridge construction procedure. If the teeth were previously in a condition approaching perfect balance, this last recommendation might not be needed. But few mouths which require even a short bridge are free from rather serious incoordination of occluding teeth, and, in such cases, it may not be possible to secure a complete balance after the bridge is completed, except by an amount of grinding which may injure the bridge itself. The case should be started, then, by balancing the occlusion. Dr. Stillman has not taken up in detail the methods of correcting traumatic occlusion, and it may be well to elaborate on this point. In the first place, excessive overbite, whether on the anterior or on the posterior teeth, should be relieved. When present, it produces interference with protrusive and lateral movements. Such interference is always prejudicial to the health of the teeth involved. Long

teeth and long cusps often require so much grinding that we shrink from performing this operation. Its success, however, justifies it, and it is frequently the only means of maintaining health. A common difficulty in this field is a lack of balance between the opposite sides of the mouth, the teeth on one side striking harder than those on the other. Usually, the patient does not notice this until the bridge or denture is inserted, but becomes actively conscious of a disturbing condition after its insertion. He cannot always identify the source of his discomfort, nor is it always easy for the dentist to detect the discrepancy. It will usually be found, in these cases, that the patient will complain that he cannot masticate efficiently on one side of the mouth. This usually means that the opposite side is receiving the greater stress. Under these circumstances, grinding is required for those teeth which are receiving this major pressure. The process of correction is frequently laborious and tedious. This fact should not be a deterrent for, unless the balancing is done, the patient remains conscious of an unsatisfactory condition and may be made extremely unhappy thereby. As a last step in this procedure, the use of carborundum paste, by means of which the patient gives the last necessary touches to the balancing process, is not to be overlooked.

Austin F. James, Chicago, Ill.: In handling periodontal patients, who are prospective subjects for the partial restoration practitioner, it is my custom not to be too quick to condemn all questionable teeth. It is much wiser to clear up all infection and balance the occlusion, then drill the patient in home care of the mouth until it can be determined just how successful the periodontal treatment has been. If the most questionable teeth are removed at once, restorations frequently have to be made long before there is proof that reinfection can be prevented or that the patient will be faithful to the instructions given. Partial restorations are no longer lived than the most questionable abutment used, and frequently bad judgment or lack of cooperation on the part of the patient will cause the failure of well constructed restorations. Recently, a case came into my practice in which two of the most beautifully constructed and finished bridges and several perfectly fitted inlays had been placed where the teeth were reeking with periodontal infection, and the patient had not been told that this condition existed. Within three weeks after the work was finished, the patient was referred to me by his physician. Periodontal treatment was instituted, and the condition cleared up.

PARTIAL DENTURES*

By POLK E. AKERS, D.D.S., Chicago, Illinois

IT will be the purpose of this paper to set forth some practical facts and observations in connection with a comparatively new method in the field of partial denture restorations.

This method was brought out approximately eight years ago, at which time, you will recall, cast clasp cases, as they were then constructed, had justly fallen to a very lowly position in the estimation of both the profession and the patient. With the exception of a few minor changes, this technic remains unchanged to this day. Thus, it can be seen that this type of restoration has already acquired a degree of background from which we can form a fairly valuable idea as to its permanence, influence on abutment or remaining teeth, and comfort and satisfaction to the patient.

The principal points that I wish to bring out in relation to design and technic as compared with those employed in the early method are briefly as follows:

1. The casting of the entire case in one piece, directly to the model, this eliminating the likelihood of the various component parts getting out of relation. This not only does away with a succession of impressions, but also obviates a number of soldering operations, which subject the case to the possibility of being pulled out of relation. I cannot emphasize too highly the importance of this point.

2. The relief of the impression to restore proper interproximal space and avoid impingement on vulnerable parts of the teeth.

3. The provision for occlusal stops for every clasp.

4. The narrow half-oval clasp, highly polished on the inside, covering a minimum of tooth.

You will all agree that the field for partial denture cases is not decreasing. Cases in which such work is indicated appear frequently and regularly. These cases have to be dealt with one way or the other. The patient is seeking the restoration of the missing members for the sake of appearance and function. The dentist is obviously interested in supplying this want to the utmost of his ability.

Aside from the mutilation of abutment teeth, etc., the patient, generally speaking, is not greatly concerned as to what particular method the dentist may see fit to employ.

It matters not to the patient whether you have spent hours, days or even weeks of painstaking laboratory and chair work in the construction of the case: his valuation of the work is measured in terms of comfort, appearance

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and function. Neither has he any special interest in the materials used, provided they are suitable to the purpose for which they were intended; do not deteriorate with use, and provide the proper cosmetic requirements.

It is apparent that we must deal with situations as we actually find them, not as we would like to find them. In many cases calling for partial denture restorations, is it not true that the loss, for any considerable length of time, of the teeth we are now seeking to replace, results in a gross abnormality of the occlusion and alinement of the remaining teeth? The teeth opposed to the missing teeth have extruded in varying degrees; the adjacent teeth in the same arch have shifted, and the symmetrical normal planes of occlusion are lost beyond recall. In extreme cases of this type, it would be manifestly absurd to attempt to restore full normal occlusion. Yet these cases can be supplied in the great majority of instances, with happy results. Properly designed and cared for, these restorations, instead of becoming a menace to the remaining teeth, actually tend to improve mouth conditions in general.

Partial denture work has been, and no doubt always will be, a field beset with many difficulties. Perhaps no branch of dentistry calls for a higher degree of engineering skill and sound judgment. It is in no sense a field for the novice, yet it presents no insurmountable difficulties for the average practitioner.

Success with this method, as in other fields, will attend in direct proportion and degree to the faithful observance of the principles and technic. There is a definite purpose behind each step in the technic, and no step can be omitted or altered without jeopardizing the success of the case.

A point stated in previous articles which I would again like to emphasize is that this work was never intended to be a panacea for all partial denture ills. Experience has shown, however, that the contraindications are surprisingly few.

Summing up eight years' experience with this type of work, which has been met with such a cordial and gratifying reception by the profession in practically all countries, I can see no reason for any apprehension in regard to its future status. Where it has been employed with intelligence and honesty of purpose, it has practically eliminated mutilation of teeth for abutments; greatly reduced dental drudgery for both the dentist and patient; provided the patient with comfortable and good appearing substitutes, and last, but perhaps not least, it has been an important item from the individual economic standpoint of the average dentist.

TECHNIC

Preliminary Preparation of the Abutment Teeth

1. Polish well all teeth to be clasped.
2. Inspect carefully abutment teeth for the most convenient place for the occlusal rest. If no natural depression is present, make one, as a counter-sunk space for occlusal rest is indispensable. A depth of one thirty-second is sufficient.

Impressions

1. Use only ordinary impression trays (not split trays), sufficiently deep.
2. Take impression in impression material mixed thin with cold water and well spatulated.
3. Add salt to hasten setting.
4. Oil the tray slightly to facilitate removal of the tray from the impression while in the mouth.
5. Be sure to seat the tray well down toward the occlusal surface of the teeth, as

this aids in breaking out the impression material.

6. Remove the tray from the impression.

7. It is generally better to start breaking out the impression by inserting the index finger over the buccal portion near the posterior border.

Assembling Impression

1. See that the tray is free from any small particles which would interfere with replacing parts in their relation.

2. Place parts back in the tray. Be sure that they are seated back in the tray and seal to the tray with base plate or bite wax (not sticky wax).

3. When the impression has been completely assembled in the tray, if any slight cracks are present do not, at this time, flow the wax in, but trim off from the model later.

Preparation of Impression

This is an all important step in this work. Trim out in the impression any undercuts that may exist adjacent to the abutment teeth. This is imperative for the reason that it permits the case to go to place and restores the normal interproximal space.

This point probably needs elaborating. By trimming out all undercuts, I mean to trim from the gum line to the contact point adjacent to every tooth to be clasped. This will allow the case to go to place, and will restore a natural interproximal space. Be sure this is understood before going further.

1. Paint the impression with separating fluid while slightly damp, using two coats if thin and one if thick. If the case is absolutely dry, place it in a bowl of water momentarily and then paint. Dab the cusps with the brush to prevent too much settling there.

2. Allow about five minutes to dry and then place in water while mixing investment No. 1.

3. Run the model with investment No. 1. Use cold water, mix fairly thick and, after spatulating for a minute, place a lid over the rubber bowl and shake well to a fairly thick mixture. This dispels air bubbles and gives a uniform mixture. If this is properly done, an exceedingly hard, smooth model will be obtained.

4. Trim the model moderately (giving the final trim after separation) and leave it to set for one hour.

5. Place the model and impression in a pan of cold water and bring to a boil with a low flame. The impression will dissolve and the separator can be peeled off.

6. While the model is wet, draw the design with an indelible pencil. Relieve the model if any teeth are to be used as abutments.

7. Leave the model until perfectly dry (say, twenty-four hours) or place in oven at low heat for a short time. Otherwise, the wax will not adhere to the model.

Designing

1. Cases should be as little complicated as possible.

2. Clasps, if kept narrow, become practically self-cleansing. They must run just below the line of the bell of the tooth. This does not necessarily mean horizontally, as this line is not always horizontal. Examine the model from all angles for making the line of the bell of the tooth with a pencil.

3. Do not forget that a clasp can be opened or closed with pliers if necessary to strengthen or loosen the hold on a tooth. Do not make more clasps than are necessary for retention. On the other hand, if unable to obtain a sufficient clasp hold for a case, carry on the extension to another tooth, and to this attach a clasp. In the case of a double or treble clasp, the clasps should taper off in width as they approach the embrasial hook, as this adds to the appearance. Use all means to get a spring in the clasps; keep them narrow in width and somewhat delicate beyond the axial angles; have a narrow saddle attachment, and, when building lingual bar cases, build the bar to meet the saddles and not the clasps. Clasps must be as nearly free as possible to get the necessary spring.

4. To prevent pressure on the tissues and also straining the bridge, always place a "rest" on either side of a bridge. This applies to single anterior teeth in partial cases where it might be overlooked. When a rest cannot be fitted on one side of a bridge, carry an extension to a tooth farther distant, and to this attach a rest.

5. Palatal bars give a greater feeling of security than horse-shoe bases, but there are times when palatal bars cannot be used.

6. In the case of an upper tooth with one abutment, a mean cuspid, use a palatal bar.

7. When all teeth are missing in the upper jaw except the second molars, a horseshoe case is indicated. A spring from side to side will aid retention.

8. For a lower unilateral case, use an embrasial hook.

9. Keep the vulcanite attachment saddle to the lingual side. For these, use 22-gage wax.

Waxing

(For All Gold Lingual Bar Case with Tube Teeth)

1. Before waxing, see that the model is perfectly dry.

2. Warm the model slightly over a Bunsen burner.

3. For clasps, use 20-gage wax; saddles, 22-gage; bars, 22-gage, two thicknesses.

4. Grind the tube teeth to fit the case, but first decide as to whether they are to be used as abutments.

Cone-shape the root end of teeth with a porcelain finishing disk.

When ground, see that the teeth lie from 1 to 1.5 mm. below the line of occlusion to allow for cementing.

5. Place the wax for clasps (make slightly wider than sketched and reinforce the axial angles to the occlusal rests if necessary); then saddles; then bar and wax together.

Cut a strip of wax from the saddle; i.e., the part to which wax pins are to adhere.

With a wooden tooth-pick, rub glycerin over the teeth and within the pin holes.

Thread wax post, made by a hypodermic syringe, or roll a wax pin through the pin hole of the tooth and form the excess into a lump on the under surface. Heat this over a Bunsen burner and press on the model in correct position. Leave there, and repeat with the next tooth. Shape with a hot spatula when all the teeth are in place.

6. Fill in between the teeth and between teeth abutments with the wax smooth over the saddle, adding wax on a hot spatula if necessary.

Do not overbox the teeth.

7. Place the wax model under cold water, remove and then carve with a sharp knife. Withdraw all teeth and replace. This is best done by holding the model with one hand and resting on the bench and withdrawing with the other hand resting on the bench (for steadiness to prevent displacing posts).

8. Finish with a hypodermic needle. I use a Heidbrink waxing torch, and then wipe over with china silk. Do not forget that it takes less time to work wax than gold and that less gold is wasted when finishing.

Sprueing

1. In nearly all cases, use only one sprue made out of base plate wax. In using only one sprue, the gold has to "come back" to give "leads" to these points.

2. Make it amply large if a centrifugal casting machine is used. It may be as large as a slate pencil.

3. Attach it firmly to that part of the wax on the model which will give the molten gold the best opportunity for a direct flow. In lingual or palatal bars, cut away the model, making a hole through to the bar.

Investing

1. Select a ring of suitable size for the model. One that is larger than is necessary only wastes investment.

2. Soak the model in water until bubbling ceases.

3. Paint the entire model and wax pattern (using a thin mix of sheet No. 1) to at least one-eighth inch thickness and get well around the attachment of the sprue. Do not rush this process; use two mixes if necessary. Careful painting like careful waxing pays in the long run.

4. Rest the edges of the painted model on a glass tumbler and let it set for at least fifteen minutes.

5. Mix No. 2 investment to a creamy consistency; dip the painted model in this bowl, and then fill the ring three quarters full and wriggle model into this.

6. Fill the ring (if necessary) to slightly above the rim and allow to set (say, forty-five minutes).

7. Cut a cone-shaped opening around the wax sprue to give the gold ample access. This opening will act as a receptacle for the excess in casting.

8. If there is any paper on the bottom of the ring, remove it, as this would, to a certain extent, prevent free escape of moisture when drying in oven. Also, it would hide the blue of the investment, which indicates that it has not been overheated.

Drying Out

After the investment sets so that it will break with a snap (usually about thirty minutes), put it on a radial burner with the sprue hole down and turn the gas on full. This will burn out the wax and free the water, which will take from two to four minutes for inlays and from about ten to fifteen minutes for a large case. Watch closely, and as soon as the investment in the ring dries over the top, place it in an oven that has been heated to 300 degrees, and leave for from one and one-half hours for inlays to five hours for large cases.

In maintaining a heat of from 300 to 350 degrees, time will not harm them. In fact, I leave many of my cases in the oven overnight and cast in the morning. Before casting, be sure that all moisture is out by placing a mirror over the sprue hole to see if any moisture accumulates on the mirror. Should there be any doubt about wax being present, a test can be made by holding a blowpipe flame over the sprue hole. If any wax is present, a hardly perceptible flame will be noticed on removing the blowpipe.

In case the operator is going to cast to Steele's backings or other attachments, it is advisable to run the heat of the oven up to about 500 degrees, and leave it for from ten to fifteen minutes before casting.

Rounding and balling of the edges of the casting are due to moisture. No. 2 investment is of a greenish color. If this color is burnt out, the investment has been overheated.

Just before casting, run the heat up to 400 degrees for half an hour (for large cases).

Casting

(Technic for Centrifugal Machines)

1. Place the ring on the machine and balance.

2. Place fresh asbestos foil in the crucible. This is important as it helps to retain the heat. Take another piece and double it, cut a hole in the center and place between the sprue hole of the ring and the inner front ring support. This makes a good seal, preventing the throwing of gold out from between the ring and the attachment.

3. Heat the crucible before putting in gold.

4. Use a brush flame first to melt the gold, then a blue flame. Use no borax; reducing flux is much better. Use a good blowpipe and play with the flame to find the correct distance for most heat. Cast when the gold gets smooth on top.

Finishing

1. Cut off the sprue with a separating disk or a mechanical saw.

2. First prepare the clasps; using seven-eighths inch heatless stones and separating disks.

a. Get all the length possible by trimming the shoulder, to obtain necessary spring.

b. Remove all undercut from the gingival side where there will be no spring.

c. Stone the occlusal side of the clasp, making the approximate required width.

d. Make oval but leave enough (especially at axial angles) for polishing, outside as well as inside. If not made too weak, clasps can always be bent to obtain a higher grip if necessary.

Finish the inside of the clasps, using: (*a*) gold finishing burs or hub-shaped stones; (*b*) sand paper disks; (*c*) a felt wheel or piece of cotton wrapped around the fissure bar with a tripoli on it (use a second time, and polish); (*d*) Burlew disk.

If necessary to further trim, use porcelain finishing disks.

3. Buff with rag wheels (three and one-half inch) and polish.

4. Boil in washing powder and dab with a brush.

Technic of Casting to Backing; Steele's Facings

1. Grind teeth without their backings to fit case (for temporarily holding tooth on model when fitting, use a bit of soft wax).

2. Put on gold backing (alloy backing should not be used) and trim with scissors. Then use stone for a close fit.

3. Criss-cross gold backing with separating disk to give suitable surface for the attachment for casting gold. Another method is to put a spot of 18-carat gold solder on the backing and then hold over a Bunsen flame. This will act as a medium of attachment.

4. Remove soft wax, place the tooth in correct position and then flow a little melted casting wax behind it. Remove the facing, moisten, replace and then reinforce further with melted casting wax. See that the wax fills all interstices and place a little additional wax along incisal edge.

5. Be careful not to run the sprue too near the tips of the backings or the heat of the molten gold may melt them. I have seen this occur.

6. Steele facings are indicated for a close or harsh bite; also in single anterior teeth in a partial case when there are clasps or rests or both on either side.

DISCUSSION

F. van Minden, Chicago, Ill.: The subject which Dr. Akers has just presented is of great importance to our profession and seems to become increasingly so each year. When diligently applied, there are few cases that cannot be properly cared for by this method and its possibilities are almost unlimited. We should bear in mind, of course, that there are certain conditions under which this type of restoration would not be indicated. No one with mature experience would restrict himself to just one method to the exclusion of all others, regardless of their greater advantages in certain cases. Nevertheless, the fact remains, that, in my hands as well as in many others, this method has proved to be a boon without which it would be difficult, if not impossible, to continue to practice dentistry. Removable bridges are subject to more observation, criticism, use and abuse on the patient's part than fixed bridges, just because they are removable. Unless we are dealing with patients of sufficient intelligence to appreciate the advantages this method entails, it would be folly to even hope for a moderate degree of success. The patient who is unwilling or unable to care properly for such restorations is much better off without them. Patients whose health and general resistance are jeopardized and undermined by various causes so that their local, oral resistance has been materially decreased are not fit subjects for this work either. While properly constructed one piece castings may restore the occlusion and help to stabilize the bite where possible, healthy abutments with sufficient resistance to withstand the strain that may be placed on them are a requisite. Such teeth are not to be found in the mouths of sick patients, and it would be well for any one providing restorations and correcting malocclusion to satisfy himself first as to the patient's health and resistance through physical examination by a competent physician. I wish to make a plea for completely restoring and stabilizing the occlusion rather than partially doing so. The patient with a malocclusion requiring extensive restorations in both the upper and lower jaws is not in need of bridges satisfying only the cosmetic needs, but he requires the services of a man who will take the time and trouble to restore the entire occlusion and stabilize the bite so that further tooth migration shall be impossible. Obviously, this is a difficult task and one calling for a great deal of experience, judgment and skill. Study models and a complete radiographic examination are but the starting point. Proper consideration of the health, habits and temperament of the patient comes next. The designing of the correct restorations follows, and only then can the careful execution of this casting technic bring the results so much desired by both the dentist and patient.

PERIODONTOCLASIA—A WORKING HYPOTHESIS*

By J. S. BRUSKE, Amsterdam, Holland

IN the extensive nomenclature characterizing the primary affections of the tooth-supporting organ, the name "paradentosis" or "periodontoclasia," depending on the preference given to the Latin or Greek nomenclature, seems to me the most desirable because this name suggests the nature of the affection, i.e., the destruction of the tooth-supporting organ. Pyorrhea alveolaris, as a term, simply indicates a secondary complex of symptoms, but not the nature of the disease itself, though nearly always "pyorrhea," or a flow of pus, definitely accompanies the affection.

The collective noun "paradentium" comprises a group of substrata, or tissue components, which not only differ as regards their histologic structure, anatomic construction and physiologic or functional significance, but also in many other respects. In fact, each of them can separately play a more or less primary part in the pathology of the affection here discussed, depending on their fundamental biologic characteristics.

It is apparent that a certain resisting power, as regards both physiologic and pathologic aspects, is inherent in every organ or tissue. This biologic or physiologic resistance is the result of formative or morphologic powers, produced by formative irritations on the one hand and by complexes of functional irritation on the other. By functional and formative powers, as these terms are used in this essay, two complexes or endogenous irritations are meant, which centrally and biologically govern the equilibrium of the organs.

The definite form of a certain organ or of a substratum as a subordinate part of it, has to fulfil certain anatomic and histologic conditions. The power which determines this form may be called the formative power. The first and most typical expression of formative power is the growth of tissues and of organs, comprising the structure and the integrity of the elements of the tissues. The fundamental characteristic of formative power is the extension of the tissue or organ within limits, fixed beforehand according to the architectural plan of Nature. This controls construction, and regeneration, where possibly the architectural plan of Nature might be influenced retrogressively. This extentension is to be considered a biologic tension irresistibly exerted by Nature.

The formative power must be equal to the functional power, in order to satisfy the physiologic requirements of the organ, both in respect to its efficiency, and in connection with other parts of

*Read before the Section on Periodontia at the Seventh International Dental Congress, Philadelphia, Pa., Aug. 24, 1926.

the organism, with which it must be in accord, both functionally and organically. As a basis, both powers possess the dynamic-biologic character, and when the resistance of both powers is stable, equilibrium is reached. We may then consider this as functional adaptation.

The degree of this resistance is hereditary, both that of the formative power, which fixes the definite type of the organ or its subordinate parts, and the functional power, fixing either by itself or by mutual proportion the labor to be performed by the organ or by its components. The equilibrium of formative and functional powers is subjected to and fixed by systemic qualities of the individual, factors which control metabolism.

The degree of resistance varies in different individuals, and this is the very fact which, with the nature and etiology of paradentosis in view, must guide our study. Indeed, every affection or pathologic condition inherent in a certain organ is dependent on the degree of resistance against specific damaged. The predisposition to disease is inherent in certain individual organs or organisms. When the equilibrium of formative and functional power is reached, a state of immunity against certain detrimental influences prevails. For immunity is that quality of the organ or individual which makes it resistant to such influences as will attack or even destroy one which is not immune, i.e., susceptible.

Now paradentosis, when it occurs, is to be attributed to a deficiency of resisting power of the paradentium, originated by a disproportion of the equilibrium between formative and functional power. An example of such deficiency is the symptom characterized by Gottlieb under the name of *der Bergriff der Wanderung* (the idea of wandering).

In fact, the position of the teeth, when thus altered in respect to their alveolar-bedding, is the result of decreasing formative irritation and power of the tissues. The paradentium then appears no longer to be able to withstand irritation by its endogenous functional power, exercised in the tissues on the one side and by the mechanical labor on the other side. In this way, chronic trauma becomes a fact. The biologic proportions between resorption and regeneration have been modified to the detriment of the latter.

From the metamorphosis of the osteoblasts and cementoblasts, we observe that a destruction of the pericementum and the alveolar periosteum is taking place, with a degeneration (dystrophy) of the alveolar tissue. This regression may be considered as an approaching senility of the particular organ, at whatever age it may occur.

The pressure on the teeth exercised by mastication in any direction other than that in which such stress is regularly distributed over the periodontal surface causes overwork. This overwork is a secondary action, for before the condition of *Wanderung* has become active, the paradentium was able to resist an equal amount of stress, while here the reaction is resulting in what Stillman, McCall and Box call traumatic occlusion. Trauma was existing already, latently, when the occlusion was in a state of anatomic-physiologic

equilibrium, but it appeared as chronic trauma by anatomic alteration of the parts involved, after being influenced by a certain excess of functional power.

The individual, having, during many years, been immune against certain affections, at a certain age becomes susceptible to disorders to which he appears to be predisposed. Evidently, formative power is a factor inherent in youth. The cells, after retrogression, regenerate, and are substituted by fresh elements in abundance. This is growth. Growth is bound to periods, and the latter again to certain or relative limits of age.

When, before the end of these periods of growth, the factors of formative power and functional power are not relatively brought into a definite equilibrium, a diminished resistance of a certain organ or a subordinate part of it may result. The time during which the powers both functional and formative have been definitely out of equilibrium may determine the beginning of a chronic trauma.

This means that: 1. The formative power, after a lapse of time, positively undergoes a certain alteration. When the organism to which the organ belongs has reached its complete growth, its activity is restrained to a purely regenerating formation, striving to preserve the definite or individual form. As far as the bone tissue is concerned, this is expressed by corresponding resorption and apposition in an exact limited proportion. 2. As to the functional power, which undergoes alterations through the influence of time, two kinds may be distinguished: (*a*) The endogenous power, which is, or has been acting, in the organ itself, through physiologic (or pathologic) alterations, influencing the development of those organs which are functionally dependent one on the other (circulation of the blood, first and second dentition, eruption of the third molar, endocrine secretions, etc.). (*b*) The exogenous power, which is the proper mechanical function of the organ. This means the work which the organ is supposed to be able to perform, on account of the physiologic, functional place which it occupies in the organism. This will be normal as long as these functional powers do not unfavorably excite the formative powers. Functional adaptation, which is virtually identical with specific immunity, then prevails.

Under such circumstances, chronic trauma is initiated, owing to the functional incitements. The thesis of Gottlieb, that "complete eruption inclusive of the apex is a mere physiologic process, would, therefore, be accepted with reserve, because of exfoliation, in the case of some teeth or in certain individuals even at a very advanced age, fails to take place under conditions of an intact vitality of the cementum; while, in numerous young precocious individuals, complete eruption has taken place. It seems that, without the advanced age of the individual as a whole, some organs, in this case the paradentium, are destined to grow old at too early a period of life. Such a complete eruption might be called only relatively physiologic. Through this, an unduly early physiologic senescence predisposing to "trauma" may be initiated.

Biology and knowledge of the system constantly bring forth new problems. Therapy tries to learn from physiology. Both cellular and humoral pathology alternatively compel us to search for preventive and therapeutic measures on a biologic basis, while the idea of functional adaptation consciously or unconsciously is running like a red thread through all the domain of study.

Indeed, recently the question was brought up, for instance, of a chronic rheumatic trauma, this meaning that the function or equilibrium has been disturbed. A certain organ (for instance, the extremities) predisposed by form and proportion to perform a certain function, after a time is retrogressively changed or damaged, by the same function; whereas, in case of normal functional adaptation, this organ should be able to construct or to maintain itself normally.

No clinician will consider a chronic rheumatic trauma, for instance, as a merely local process, and when contemplating the etiology of the affection, the trauma itself should not be considered primary, but the diminished resistance of the tissue. The cause should be sought in the general system, which is not able to furnish sufficient resisting power to the tissues. An individual affected by this disease is predisposed to it.

The primary causes of the destruction of the paradentium are not to be considered as purely mechanical, but more as biologic or dynamic. During dentition, the dental elements must make their place in the alveolar process. This bow-shaped bone crest, of an individually limited extension, consisting of a consecutive row of alveoli, close together has developed morphologically at the same time as the body of the jaw, on which it is placed. But it only receives its definite form and function from the teeth, subsequent to their eruption. When, by a certain functional equilibrium of their own, the teeth, with their alveoli, each by itself, have passed the original level of their base, or even prior to this phase of development, they are acted on by secondary influences, exerted by functional incitement of the alveolar process or of its segments, in which similar processes of development take place in successive periods.

Now, if dentition proceeds regularly, the functional complex of excitation of the entire alveolar process is able to create normal functional adaptation.

Even during the period of the first dentition, it would seem that the amount of space which this row of alveoli will present to the second dentition is determined. Numerous exact measurements have shown that the width of the arc of the alveolar process of the deciduous teeth from first molar to first molar is equal to the width of the arc of the permanent teeth from cuspid to cuspid. As a rule, the permanent teeth erupt on a higher level, this becoming apparent in those cases in which deciduous teeth are being retained; as, for instance, when the germ of the permanent tooth is absent. Now, the moment the biologic-dynamic power of the organ is in equilibrium, the tissue resists the tension of the developing erupting elements. This tension must not be sought for

solely in a direction perpendicular to the tooth eruption, or possibly diverging lingually or buccally; but, it appears also that the teeth in the alveolar process are forced in a horizontal direction.

The foregoing treats the question in connection with processes in the dental system itself, but, for the rest, the dynamic equilibrium is influenced by many other more remote biologic factors. Bone tissue, as we know from our experience in orthopedic and orthodontic practice, as well as from experiments on animals, combines in a high degree a biologic plastic property and physical hardness. This is particularly to be observed in the alveolar process. The possession of these seemingly conflicting properties may be explained by the fact that, after the period of growth of the individual, a constant rebuilding of the bone occurs. Bone resorption and regeneration continually interchange in adult individuals, depending on the influence of the function. This constant rebuilding is the effect of the endogenous incitement of the formative, organic power, remaining in force for a long time after the period of growth has been complete.

A normal muscular function of the masticatory apparatus already may involve an incitement which the rigid bone tissue cannot resist, and by which chronic trauma induces a transfer from a more latent resorption to a state of real atrophy.

In a series of lectures, as yet unpublished, bearing on biologic factors in dentomaxillofacial orthopedics, our countryman, Dr. van Loon, among others, has called the periosteum, inclusive of the pericementum, which comprises the anatomic and physiologic attachment of the inner surface of the alveolar process to the cementum a buffer system. He states that, on this tissue, the concussions are deadened, and, from it, a protecting complex results against the impacts and lateral stresses which each of the dentures, in its masticatory action, produces on the paradentium.

Osteoclasia, when progressing through disturbed or totally suppressed formative incitement, has a free domain. In purely physiologic phases of tooth development (if trauma is absent), we observe a similar phenomenon during the development of the second dentition. The endogenous formative power of the temporary organ, although on quite another basis than that under discussion here, has ceased to function. On the other hand, the functional power of the eruption of the oncoming teeth, is exerting such an internal physiologic tension on the tissue as will completely destroy the alveoli of these temporary structures, including the roots of the deciduous teeth.

In this paper I have refrained from speaking about pyorrhea, considering this morbid symptom as secondary, i.e., an advanced state of periodontoclasia in which inflammatory infiltration and infection of a nature, either specific or not, has become manifest.

When I called the development of these collective observations a "working hypotheses," I did so because I wanted to put this consideration over against the narrow and widely held point of view that the local complex of symptoms, or a part of it, is to be identified

with the etiology; for while it is true that local therapy, even in an advanced case, may succeed, nearly always it is necessary to be on our guard to apply preventive or therapeutic measures in order to avoid the frequently occurring recrudescence of symptoms.

In the majority of cases, the affection is detected in an advanced state, owing to the clinician's having failed to observe the initial mild symptoms or having considered the latter as harmless. At a very early age, the incipient destructions of the paradentium should be watched in order that those factors which might accelerate the process locally may be checked.

From an exact clinical observation of many years, watching the development of paradentosis within succeeding generations, I have reached the conclusion that probably the affection is of an hereditary nature; that is to say, an individual, systemic predisposition must be present. Still more will it be necessary to study the problem as to which general constitutional factors cause the reduction of resistance.

Only when we are able to investigate this problem successfully on a biologic basis will it be possible to take preventive measures, but, first of all, the eye must be directed to the etiology. The pathology of paradentosis, as, in fact, pathology in general, is founded on a state of disequilibrium of physiologic factors.

CALCIUM, ITS ACTIVATION, UTILIZATION AND METABOLISM*

By WESTON A. PRICE, D.D.S., M.S., F.A.C.D., Cleveland, Ohio

FEW problems of biologic science have been more difficult of understanding than the processes by which the teeth and bones are formed. Some of the factors involved are coming to be understood. In this paper, I shall discuss some of the newer phases.

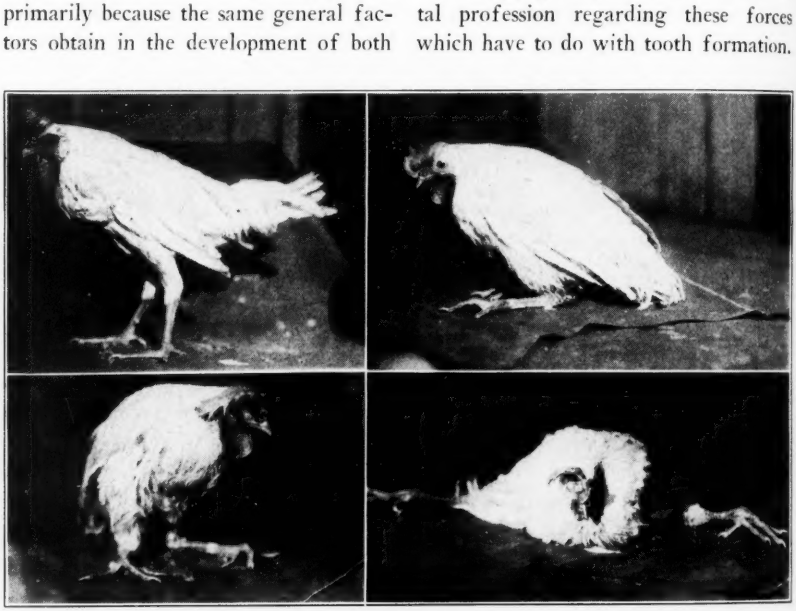
In previous communications, I have presented data which relate to some of the fundamental conditions. Evidence was presented which relates the type of reaction in bone, as it appears with different expressions in different individuals, in such a manner as to make possible the dividing of these individuals into groups on this basis, and further which indicates that these factors are related to defense and to susceptibility to disease. These data have been reviewed.[1]

Many workers have presented data relating radiant energy, and certain vitamins, to calcium utilization. Outstanding among the workers in this field have been Mellanby, Hess and Steenbock. The bibliography is now too voluminous to recite. I have used more than 1,000 chicks in the last fifteen months in studies on this problem. These studies have brought out many important new data. The beneficial effects of radiant energy are readily demonstrated by many experiments. Figure 1 shows the progressive weakening of the legs of a chick deprived of radiant energy while on a diet low in phosphorus and the antirachitic factor, though ample in calcium. The control, at the upper left, *A*, received the same diet, with sunshine. *B*, *C* and *D* show progressive weakening of the legs, so that the chick came to complete prostration. A similiar chick, so prostrated, is shown in Figure 2*A*. The same chick, a few weeks later, is shown in *B*, after having cod-liver oil added to the deficiency diet. There was the same absence of radiant energy. The legs are deformed, as will be noted, though they were progressing toward normal. A splendid illustration of the change in this chick is shown in three roentgen-ray views of it which appear in Figure 3. *A* shows the chick when down; *B* shows it thirty-three days later than at *A*, after it had been for that

*Read before the Section on Bacteriology, Pathology and Diagnosis at the Seventh International Dental Congress, Philadelphia, Pa., Aug. 25, 1926.

1. Price, W. A.: New Knowledge of Calcium Metabolism in Health and Disease, with Special Consideration of Calcification and Decalcification Processes, Including Focal Infection Phenomena, J.A.D.A., 13: 1765 (Dec.) 1926.

period on the original diet but with cod-liver oil added, and *C*, taken thirty-one days later than *B*, shows the continued improvement in calcification. We are here directly concerned with factors which are involved in these processes, primarily because the same general factors obtain in the development of both tooth and bone structure. That the utilization of calcium proves not to be so simple a process as has been generally anticipated is abundantly demonstrated. Its presence in food does not necessarily provide that it become available for the body's use. Certain chemical activators must be provided in the system. These same processes obtain with regard to the formation of teeth, and since teeth do not have a circulation comparable to that of bone, the reconstruction of imperfectly organized tissue is not provided by Nature. Enamel, once formed, undergoes but slight change. We are accordingly greatly concerned as a dental profession regarding these forces which have to do with tooth formation.



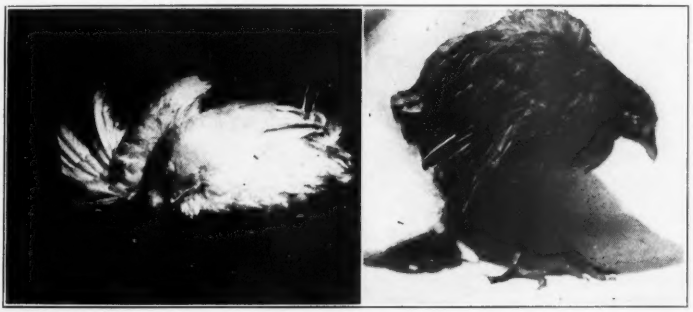
C D

Fig. 1.—Progressive weakening of the legs of a chick deprived of radiant energy and on a diet low in phosphorus and the antirachitic factor. The control (A) had the same diet but occasional sunshine.

The dentistry of the past has been largely concerned with the treatment of disease. We have come to the time in dental science when adequate programs should be worked out which will be competent to prevent in large measure the dental disease which has made dental repair necessary. These studies are, therefore, primarily concerned with preventive programs.

PARATHYROID GLANDS

The animal body is marvelously provided with monitors to supervise great fundamental phases of vital function. These are spoken of as the glands of internal secretion. Without some of these, life cannot exist, and all are needed for efficient normal life. Two small glands in the neck, about as large as peas, the parathyroid glands, are, chiefly, the monitors for calcium metabolism. Several glands influence calcium metabolism, but with most animals the elimination of no other glands than the parathyroid produces death from resulting lowered calcium of the body fluids. After their removal, the animal loses weight, serum calcium goes down from an average of 10 to 11 mg. per hundred cubic centimeters of serum to 5, 6 or 7 mg., at which time the animal becomes very nervous and usually goes into convulsive spasms, called tetany, which may last several hours or but a short time, usually terminating in death. If, prior to death, there is injected into the animal some extract of parathyroid glands, the animal is restored and will continue to live in practically normal health provided a little of this extract is injected every day or two, but continuously. When the parathyroid glands are removed from rats, a change can be seen under the microscope in the structure of the growing teeth in as short a period as five days, and, in fifteen days, is marked. These continually growing incisors readily break off when a little strain is put on them, when their extrusion in normal growth processes has brought the point of weak structure within the zone of stress. The functioning of the parathyroid glands is essenial for the maintenance of the quality of the blood which we may speak of as the solubility factor for calcium. The maintenance of the functional capacity of these glands seems to be directly related to certain activating substances which reach it through the circulating mechanisms of the body. When cholesterol, a



A B

Fig. 2.—Two views of the same chick on a diet low in phosphorus and deprived of ultraviolet radiation. A, chick completely prostrated with typical weak legs. B, the same chick a few weeks later, after having cod-liver oil added to the food. The leg deformity may be noted.

lipoid in which the skin and many of the body tissues, particularly the brain, are rich, is exposed to ultraviolet light or sunlight, it has the property of aiding the body in metabolizing calcium. Certain fats, particularly butter and egg yolk, contain substances capable of activating the metabolism of calcium. Cod-liver oil has this property in a concentration approximately 400 times that of butter.

It is an interesting fact that the Eskimos of the far north, where the light is so restricted, live largely on sea food, particularly the fats of fishes, during the long winter. It is remarkable how the developing civilization has created what we may term an instinct. For example, the people living on the Isles of Lewis, north of Scotland, which are shrouded in fog and cloud, have a practice of taking as part of the diet for each day at least one stuffed cod's liver. Children are started on this ration in very early life. When our explorers have gone into the north seas for the winters, and have tried to subsist through the long period of darkness on canned foods, flavored to tickle the palate, they have developed disease to which the Eskimos about them, whose diet they would scorn, are immune.

Since the ingestion of cholesterol unactivated by irradiation has no apparent effect on calcium metabolism, while irradiated cholesterol has a marked effect, an extract from it being capable of preventing rickets, in the amount of one one-hundred-thousandth gm. daily in a rat, it seems, in the light of the accumulating evidence from several workers, to be one of the important factors in the activation of the body for the metabolism of calcium. Its activation takes place normally through the skin, through the agency of the ultraviolet light from the sun. It has been assumed that, since artificial sources of ultraviolet produce greater concentrations of ultraviolet radiation than does the sun, these means can be used to displace sunlight or at least to compensate for it. Last year, I presented data[1] indicating that overexposure of fatty

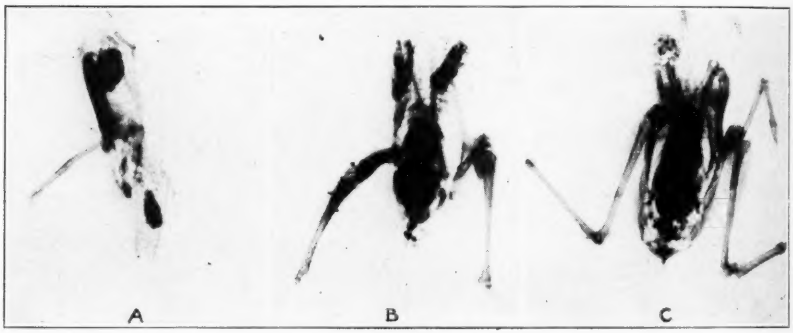


Fig. 3.—Roentgenographic views of the chick shown in Figure 2. A, appearance when the chick was prostrated; B, thirty-three days later; C, thirty-one days later than in B. Increasing calcification is evident.

substances to ultraviolet light produces distinctly poisonous effects. Increasing information strongly indicates that ultraviolet radiation, from artificial sources such as the mercury vapor lamp, is not a substitute for sunlight though it may be an important adjutant. It is probable, from researches at present in progress, that means for modification of the artificial sources to limit them to the proper ranges will make them competent substitutes.

Since the best sources of stored-up activator known at present is cod-liver oil, it has become important to consider carefully its advantages and disadvantages. In the first place, it is disagreeable for many people to take. There is some evidence that long continued taking of large doses has distinctly undesirable, if not harmful, effects. There is considerable difference in the relative and actual value or efficiency of different samples of oil. This probably is not the fault of the source of supply, but probably relates, in part, to the difference in the time of the season during which the fish are caught.

The normal source of activator for most mammalian forms is the maternal milk.

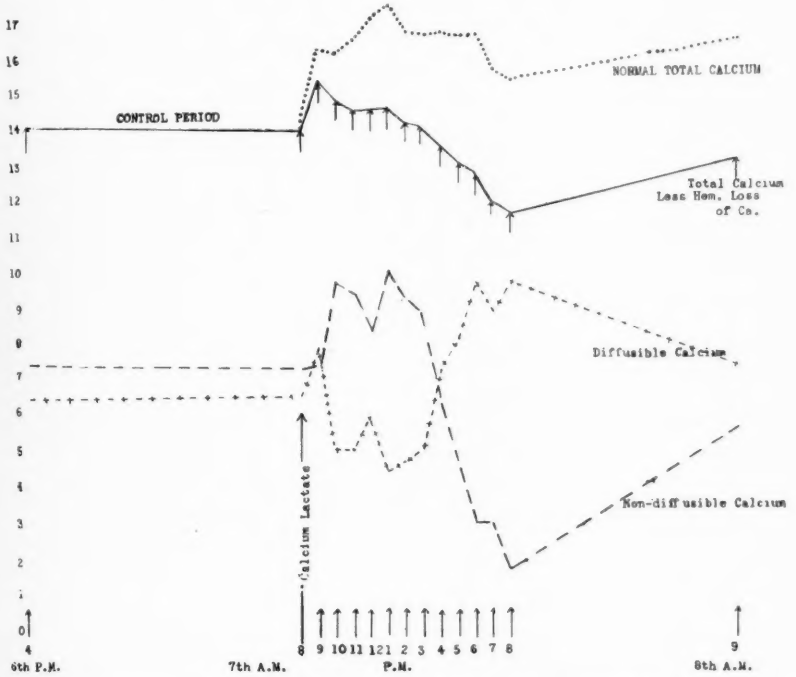


Fig. 4.—Hourly changes in three calcium levels following one administration of 2 gm. of calcium lactate at 8 a. m. (Rabbit 1403).

CALCIUM ACTIVATION

Since calcium may be present in ample quantity and not be utilized by the body, it becomes very important to determine what means may be available for enhancing the body's capacity to utilize the food. While it is known, in a general way, that certain procedures, such as exposure to ultraviolet, the administration of cod-liver oil or the eating of fish fats and oils, will greatly increase the body's capacity to utilize calcium, there are as yet few data regarding the mechanisms by which these substances act. In order to throw light on this phase of the problem, I have been carrying on extended studies regarding the effects on animals and humans produced by the administration of various substances. In order to de-

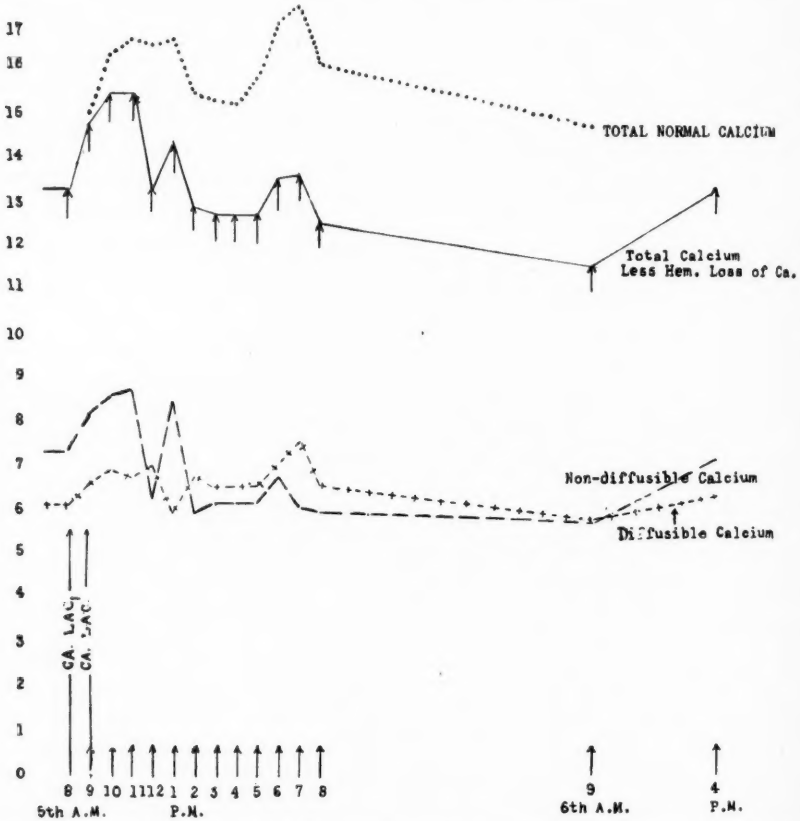


Fig. 5.—Hourly changes in three calcium levels following administration of 2 gm. of calcium lactate at 8 and 9 a. m. (Rabbit 1356).

termine these effects, it is, of course, necessary to take samples of blood. The taking of one or two or a small number of specimens may be relatively unimportant as far as changes produced by the hemorrhages are concerned. When these are carried over an extended period of time, the loss of blood becomes an important factor in the change in the blood picture. It not infrequently occurs that individuals who have had extractions have either continued seepage or recurring hemorrhage with considerable loss of blood. There have been no data as to the effect of such loss on the calcium of the blood. As a preliminary, therefore, to determinations of the effects of medication on the calcium levels, it has been important to determine the effect of frequent hemorrhages on these same calcium levels. Rabbits have been used, chiefly, and the blood has been taken by perforating the marginal ear vein and, after a little massaging with a towel, which relaxes the capillaries, the blood drops quite freely so long as the vein is compressed centrally to the lesion. The bleedings have been in general carried out as follows:

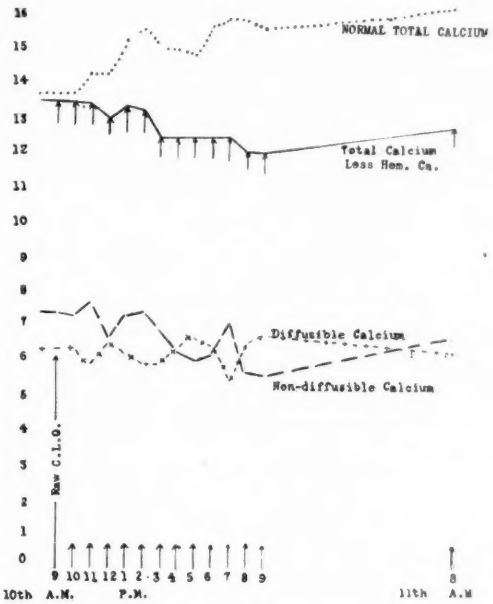


Fig. 6.—Hourly changes in three calcium levels following administration of 2 c.c. of raw cod-liver oil at 9 a. m. (Rabbit 1404).

Once on the late afternoon of one day; hourly, beginning at 8 a. m. the next day, and continuing until 8 or 9 p. m., and once early the following day. When medication was given, it followed the second taking of blood, after the first morning sample, so that the control period of two readings on

different days was had with at least fifteen hours intervening, and then a series of thirteen successive hourly observations with one or two on the following day (sometimes still later) to determine the projection of the influence.

To determine the three factors: total

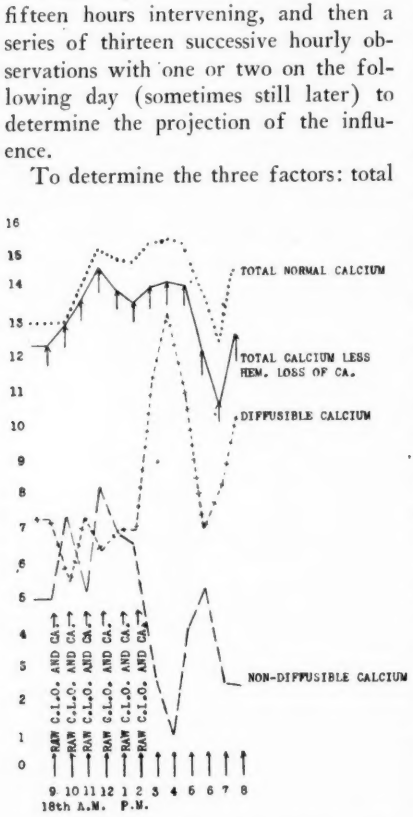

TOTAL NORMAL CALCIUM
TOTAL CALCIUM LESS HEM. LOSS OF CA.
DIFFUSIBLE CALCIUM
NON-DIFFUSIBLE CALCIUM
RAW C.L.O. AND CA.
9 10 11 12 1 2 3 4 5 6 7 8
18th A.M. P.M.

Fig. 7.—Hourly changes in calcium levels following administration of 0.5 c.c. of raw cod-liver oil and 5 grains of calcium lactate hourly for six consecutive doses (Rabbit 1419).

calcium, diffusible calcium, and non-diffusible calcium, by the older methods, and allow for duplicate readings, about 5 c.c. of blood is required. As this clearly means too great a strain on even a large rabbit, most of the determinations have been made on half this quantity by using specially designed micropipets. In a rabbit weighing approximately 3 kg. (nearly 7 pounds), the hemorrhages were produced hourly for thirteen successive bleedings of approximately 5 c.c. each, which makes a total of approximately 65 c.c. of blood. The total weight of the blood of this animal would be approximately one-thirteenth of the body weight, or 230+ gm. We would, therefore, remove within the thirteen hours approximately 25 per cent of the total blood. A much larger percentage of blood than this can be removed without serious permanent injury to the animal, although it takes a considerable period of time for complete recovery. Chickens can have approximately 75 per cent of the total blood removed and show little effect from the operation, with a relatively early recovery.

There are two purposes in this part of the determination: (1) to know the effect of hemorrhage on calcium levels, and (2) to ascertain the correction that should, therefore, be made for determining the change in calcium level which exists from medication when no hemorrhage is produced.

Since successive hemorrhages produce a regular and continuous decline in total calcium, it is particularly significant that our observations of the calcium levels of medicated rabbits are too low by an amount approximately equal to the depression which would exist as a result of the number of hemorrhages preceding that determination. We would, therefore, show in the charts both the observed calcium levels and the calculated calcium levels by inserting the progressive correction needed to compensate for the hemorrhages.

In the rabbit referred to above, the total calcium decreased progressively

with the increased number of hemorrhages and toward normal overnight after the last hemorrhage on the day before. In a chart referring to this case, diffusible and nondiffusible curves cross each other five times in that length of time. This throws important light on the mechanism for readjustment and

There has been relatively little basis for judgment as to the size and frequency of dosage for either calcium-carrying foods or medicaments, or so-called activators. A general procedure in administering the medicine has been on the presumption that the effect is extended until that supply is

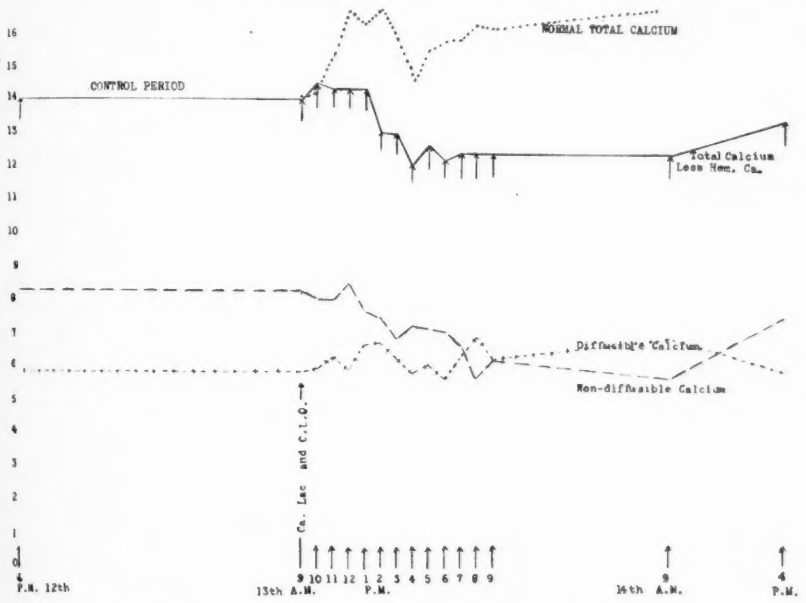


Fig. 8.—Hourly changes in three calcium levels following one administration of 2 gm. of calcium lactate and 2.5 gm. of activated cod-liver oil at 9 a. m. (Rabbit 1376).

the factors disturbed by hemorrhage. This represents a rather extreme condition, since the quantity of blood removed at each reading is relatively large, and the total correspondingly considerable in proportion to the total blood of the body. When smaller quantities of blood are taken, the change in calcium levels is approximately proportionate.

exhausted, and, therefore, relatively larger doses taken less frequently would be quite comparable to smaller doses taken more frequently. Important new light is thrown on this phase of the problem by these studies. We read in the literature of calcium compounds, such as calcium chlorid and calcium lactate, being administered to patients in doses of several grams. The fact

that the administration of calcium has frequently been tried but has not been deemed of considerable helpfulness, and further, that it is not in general use, is probably ample evidence as to its lack of efficacy, though it does not throw

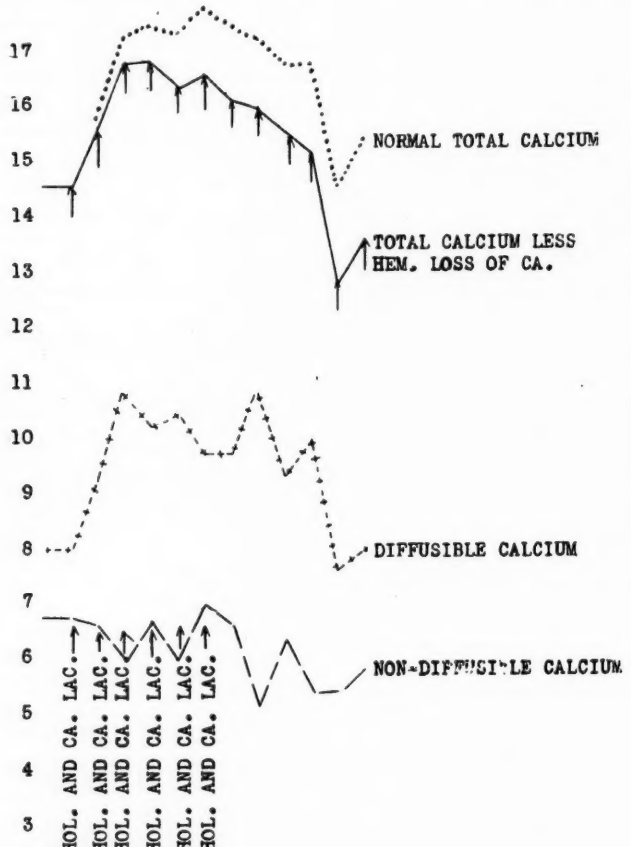


Fig. 9.—Calcium changes following six hourly administrations of each 33 grains of cholesterol activated for ten minutes under a quartz mercury vapor arc lamp and given in olive oil, and 5 grains of calcium lactate (Rabbit 1418).

light on whether the lack of efficacy is due to lack of knowledge regarding the method of administration or the presence of negligibly helpful if not distinctly harmful effects.

We will, therefore, consider first the giving of one relatively large dose of calcium lactate to a rabbit. There have been two reasons for selecting the rabbit for these observations: (1) it is desirable because of the ease of securing blood without an anesthetic or need for heart puncture, and (2) the rabbit has a recognized lack of sensitiveness to change of calcium levels (of all the milk of mammals whose blood has been tested, the rabbit's carries the highest concentration of calcium.) In Figure 4 will be seen the effect of the administration to a rabbit of 2 gm. of calcium lactate in a single dose, and the blood determinations made hourly. It will be noted that the blood total calcium increased the first hour from 13.98 to 15.35 mg. per hundred cubic centimeters of blood and, by the second hour, had fallen to 14.78 and maintained a level of approximately from 14.48 to 14.58 for the next three hours. There was then a progressive decline to 11.65, the last reading that evening being 11.65. On the following morning, the observed calcium was 13.10. Since this rabbit lost 5 c.c. of blood at each

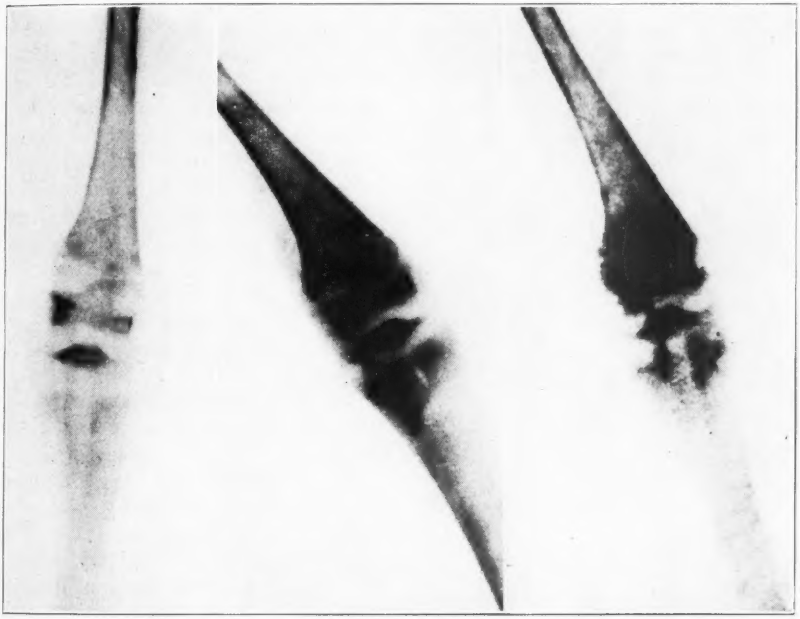


Fig. 10.—Left: Effect of deficiency diet plus sunshine through city smoke. Center: Effect of rubbing cod-liver oil on leg, as shown twenty days later. Right: Effect of adding cod-liver oil to diet, as shown six days later.

bleeding, we shall presume that there was a progressive loss from the first corresponding with that change in the last figure from hemorrhage alone. When, therefore, we add this amount to the observed total calcium, we find a very differently shaped curve as shown in the dotted line, above the total, the maximum increase reaching 3 mg. at the end of five hours, and decreasing to 1.13 at the end of twelve hours, with

Fig. 11.—Hypoplasia of the enamel associated with a history of convulsions ending abruptly at about the age of 4 years with a change of the source of the milk supply and with outdoor life.

an increase of 2.19 the following morning. Were we considering only total calcium, and were it the only important consideration, we might consider that the evidence justified this type of treatment. When we study the actual change in diffusible and nondiffusible, and their proportions, we observe that the nondiffusible has been depressed at the end of twelve hours to the tremendously low point of 1.93 mg. In other words, nearly all the available calcium has become diffusible. Since the diffusible and nondiffusible calcium should presumably balance, the diffusible in normal usually exceeding the nondiffusible by about 10 per cent, it will be observed that we have created a serious imbalance between these two calcium factors. If we consider this as a negative instance, we shall probably see somewhat of the reason for the serious depression which individuals realize after taking calcium lactate alone, without an activator.

In order to further study this particular phase, we have repeated these same doses in one hour as shown in Figure 5. The observed total calcium line is found to be flattened in its first rise and experiences a second rise followed by a third rise. The correction for total calcium is also shown in the dotted line by adding the amount hour by hour that had been observed in the control rabbit as being due to succeeding hemorrhages. Since hemorrhage itself produces an oscillation between diffusible and nondiffusible calcium, and since two successive doses brought succeeding positive and negative phases in such a relation as to, in part, neutralize each other, we do not have the extreme oscillations shown in the single dose.

About two weeks later, an effort was made to repeat the observation on this rabbit (1356) by adding to the calcium lactate activated cholesterol. The rabbit was not in good condition for either of the tests, probably owing partly to its age. A few hours after the administration of the calcium and activated cholesterol, it was observed to be depressed, and the hemorrhages were terminated. It died sometime during the following night, probably owing to

an increase in the total calcium level and the disturbance of the calcium balance by a too extensive and too rapid procedure.

Collip has shown that, by the administration of parathyroid extract, the total calcium can be increased markedly and that a too great increase caused death. I showed in my report of last year[1] that, by the administration of freshly made parathyroid extract, we were able to double the total calcium level of a rabbit in six hours, at which time the rabbit died. It seems probable that this dose was sufficient to increase so greatly the total calcium and so disturb the distribution of the calcium as to cause death. This would be equivalent to a dose of 40 gm. for an individual weighing 160 pounds, which is clearly out of all proportion. However, it accomplishes our purpose of determining the need for knowledge regarding dosage and the method for its administration.

In order to study further the relation of quantity and distribution of dosage, we have administered calcium lactate alone, and with various activators in distributed small doses in order to determine the effect on calcium levels.

In the following five charts will be seen the results of the administration of raw cod-liver oil alone, activated cod-liver oil alone, raw cod-liver oil and calcium lactate, activated cod-liver oil and calcium lactate, and activated cholesterol and calcium lactate.

Figure 6 (rabbit 1404) shows the effect on the calcium levels from the administration of 2 c.c. of raw cod-liver oil to this rabbit. The total calcium level at the beginning of the test was 13.36 mg. per hundred cubic centimeters of serum. The line marked "Total calcium less hemorrhage calcium" shows a slight depression below the starting level. The dotted line marked "Total calcium level" is the same calculated to correct for the depression due to successive hemorrhages as previously discussed. There was a sustained increase of from 1 to 2 mg. throughout the period of the experiment. A conspicuous difference in this chart from some of the others is the narrowness of the oscillations between the diffusible and nondiffusible calcium.

This is strikingly unlike the results produced by the administration of calcium lactate alone, which are particularly conspicuous in Figure 7 (rabbit 1419), showing the hourly changes following the administration of 5 grains of calcium lactate and 0.5 c.c. of raw cod-liver oil hourly for six consecutive hours. The solid line shows total calcium less the hemorrhage loss of calcium, and notwithstanding the progressive loss from hemorrhage, the calcium increased over 2 mg., approximately 20 per cent, in the first three hours. The hourly administration started at 9 a. m. and ended at 2 p. m. Immediately after the cessation of the administration, there was a tremendous increase in diffusible calcium with a corresponding decrease in nondiffusible, the latter reducing to 1.16. Having tried a somewhat similar experiment on myself, I know somewhat of the sensation that is produced by throwing the ratio of diffusible and nondiffusible out of adjustment. The body makes an heroic effort at readjustment. There is an interesting phase of this which I am discussing in an extended text on this subject, one tremendously significant, since it is so often a part of the terminal picture in the bacterial overwhelming

from toxic material from infection sources. The upper dotted line marked "total normal calcium" is the calculated total by making the correction for the progressive depression of calcium due to loss from hemorrhage in taking the specimens of blood.

Figure 8 (rabbit 1376) shows the hourly changes in three calcium levels following the hourly administration of 2 grains of calcium lactate and 2.5 gm. of activated cod-liver oil. There is a control period of seventeen hours preceding the test, and one following, checking the recovery. The striking characteristics are: the stabilizing effect of the activated cod-liver oil on diffusible and nondiffusible calcium, which I have shown to oscillate under certain treatments very strikingly. There is a sustained increase in total calcium as corrected for hemorrhage loss. It must be understood that the extreme results produced here emphasize the necessity for great care not to overdose and also emphasize the great importance of the progressive increasing or pyramiding effect produced by the continued administration of large doses.

Figure 4 (rabbit 1403) shows the hourly changes in the three calcium levels following one administration of 2 gm. of calcium lactate at 8 a. m. The control period over night shows the three calcium levels under consideration approximately stationary. The striking effect is that the diffusible calcium rises during the first hour almost precisely in accordance with the total calcium. This is followed by a sharp reversal which is apparently Nature's method of reestablishing an equilibrium between these factors. At the eighth hour, there is a reversal of the positions of the diffusible and nondiffusible, and the pendulum swings far in the opposite direction to that which obtained during the preceding seven hours. This is a striking illustration of the inadequacy or deficiency of calcium lactate alone. This large dose increases total calcium to a point shown by the correction for the loss due to hemorrhage over 2 mg. above the normal level.

In striking contrast to this is the result obtained by the administration of calcium lactate hourly, and cholesterol activated and dissolved in olive oil, the latter not activated, which is shown in Figure 9 (rabbit 1418). It will be seen that there is much less oscillation between the diffusible and nondiffusible. They have retained their general relationship, without reversal, the diffusible at all times being greater than the nondiffusible. When we correct for the loss due to hemorrhage, we find that we have an increase in total calcium from 14.50 at the start to 17.65 at the maximum, which is 3.15 mg. increase, or approximately 22 per cent.

There is a distinct relationship between the size of the dose and the length of time before its effect appears in the blood. As shown previously, large single doses given to rabbits show their maximum effect in from one to two hours.

A striking illustration of the practical application of this general principle is shown in Figure 10, which presents three views of the second joint of a chicken. *A* shows the condition after the chicken had been on a deficiency diet (Steenbock No. 2966), plus such sunshine as was available in the winter time through the smoke of Cleveland. I have recently reported at length on

TABLE 1.—BLOOD CHEMICAL STUDIES OF DAIRY COWS

Date	No.	Total Calcium	Active Calcium	Diffusible Calcium	Nondiffusible Calcium	Total Calcium plus Bone	Inorganic Phosphorus	Total Phosphorus	Sugar	Nonprotein Nitrogen	Total Fats	Cholesterol	Fatty Acids	Cell Volume	Total Calcium Error
12/8/25	A-1	11.43	8.88	8.12	3.31	10.12	5.64	31.8	62	47	667	197	470	43.2	0.2
12/1/25	A-2	11.10	9.36	5.55	5.55	10.51	3.94	35.0	81	33	620	128	490	40.5	0.3
12/11/25	B-1	11.56	8.13	5.35	6.46	11.86	5.72	38.0	62	30	615	105	480	41.5	1.3
12/9/25	B-2	11.38	9.12	5.99	5.39	11.65	6.90	67.0	62	24	544	123	382	45.0	1.1
12/9/25	C-1	11.31	9.02	6.38	4.93	10.78	3.96	68.0	55	47	521	88	430	42.5	2.0
12/9/25	C-2	11.26	9.16	6.52	4.74	10.65	4.38	60.0	52	38	482	80	400	42.5	0.7
12/9/25	D-1	11.28	8.82	4.86	6.42	11.67	6.04	36.0	52	43	593	131	460	38.0	0.5
12/9/25	D-2	9.32	9.36	6.68	2.64	10.81	4.83	67.0	54	43	527	123	400	40.5	0.5
12/11/25	E-1	12.26	9.04	6.33	5.93	10.43	5.88	67.0	53	38	563	111	450	38.5	0.0
12/9/25	E-2	11.14	9.04	4.69	6.45	10.98	6.67	60.0	58	42	620	94	550	38.6	3.3
12/9/25	F-1	11.38	11.05	4.69	6.69	10.04	6.48	36.0	62	29	577	198	470	44.8	1.8
12/9/25	F-2	11.58	8.42	6.33	6.33	11.82	5.00	32.0	63	30	655	97	530	43.5	0.2
12/18/25	G-1*	11.92	10.15	6.15	6.76	13.03	6.25	97.0	81	34	880	61	820	38.3	0.2
12/18/25	H-1	10.90	9.22	4.25	6.65	10.80	5.56	63.5	56	28	1112	65	1050	39.5	0.0
12/18/25	J-1	11.08	9.49	5.59	5.49	11.16	5.24	35.0	62	32	1403	121	1280	40.0	0.2
12/9/25	I-1	11.38	8.57	5.18	6.40	10.38	6.67	35.8	58	31	544	161	380	38.0	0.5

*G-1 is a 2-year-old heifer

this phase.[2] The rubbing of cod-liver oil on to this chicken's leg made a marked difference in as short a time as twenty days in its ability to use the leg. The change is also marked as shown in the roentgenogram in *B*. *C* shows a marked change in the following six days, when the cod-liver oil was added to the chicken's diet, plus its being applied to the second joint. This strongly emphasizes the marked influence of the activators on animals which are being fed a deficiency diet at a time and under conditions when normal sunshine is not available.

MILK AS A SOURCE OF ACTIVATOR

We have looked on milk as being adequate for providing the needs of young life whether furnished by the mother or by another species. In using milk from other origins as a source of activator as well as of calcium, it has generally been assumed that milk is milk, and is always competent. In the accumulation of my clinical data, I found striking evidence of an inadequacy in the supply of milk. Figure 11 shows the teeth of a boy, 8 years of age, who has the following history. He suffered from severe convulsions in babyhood, which extended with decreasing frequency to between the third and fourth years. At this time in the spring of the year, the parents moved to a country town, where the child played outdoors and had a different milk supply. His convulsions promptly ceased, and he started growing rapidly. It is probable that the change in calcium metabolism indicated by the change in shape of these teeth correspond with this change of environment and milk source.

2. Price, W. A.: J. Indust. & Eng. Chem., 48 (July) 1926.

TABLE 2.—CHEMICAL ANALYSIS OF MILK OF DAIRY COWS

Date	No.	Specific Gravity	Total Calcium	Active Calcium	Diffusible Calcium	Nondiffusible Calcium	Inorganic Phosphorus	Total Phosphorus	Sugar	Nonprotein Nitrogen	Total Fats
12-18-25	A-1	1.032	109.30	8.51	45.27	64.03	47.4	674	1,612	302	2.4
12-18-25	A-2	1.0335	154.30	9.71	56.20	98.10	56.3	988	1,230	650	3.4
12-18-25	B-1	1.034	108.40	9.27	45.01	63.39	50.0	1,500	1,548		3.2
12-18-25	B-2	1.035	103.75	9.86	44.80	58.95	65.2	1,450	1,655	250	3.8
12-18-25	C-1	1.033	169.70	9.33	34.10	135.60	65.2	1,400	1,714	540	2.4
12-18-25	C-2	1.036	192.70	9.33	37.80	154.90	66.8	1,350	1,714	100	3.4
12-18-25	D-1	1.033	187.50	9.55	35.40	152.10	64.5	990	1,622	626	4.2
12-18-25	D-2	1.035	179.90	9.44	47.92	131.98	63.6	1,313	1,558	500	3.1
12-18-25	E-1	1.040	153.12	9.86	47.40	143.26	64.5	1,430	1,714	100	3.8
12-18-25	E-2	1.037	125.60	9.71	60.08	65.52	66.8	1,615	1,714	100	3.6
12-18-25	F-1	1.037	128.50	9.27	45.00	83.50	66.8	1,820	1,702	100	3.5
12-18-25	F-2	1.036	125.60	9.64	54.60	71.00	72.5	1,220	1,703	100	3.3
12-18-25	G-1										
12-18-25	H-1		123.70	9.22	64.70	59.00			1,690	650	
12-18-25	J-1	1.036	100.40	9.15	36.45	63.95	57.2	1,000	1,570	100	3.4
12-18-25	I-1	1.036	135.60	9.44	53.80	81.80	60.5	1,140	1,600	400	3.1

Several years later, he developed mild symptoms of convulsions, which were completely relieved by the administration of cod-liver oil. The accumulation of a quantity of this type of data led me to make a study of the comparison of the relative values of different milk, and also of means for enhancing and reinforcing those qualities in milk which are primarily responsible for the improvement of calcium metabolism. A review of the available data revealed that there was relatively little information at hand indicating normal levels of various factors in both blood and milk from the same individual. Before relative values could be observed, it has been necessary, therefore, to establish a group of approximately normal factors and to observe those factors which are influenced chiefly by such changes of diet and environment as will make the milk of such an animal more beneficial for such factors as growth, calcification and defense against disease. Since this is a preliminary report, and since data involved are too voluminous to be included in detail in a single communication, it will be necessary to summarize here some of the factors determined. For these studies, an arrangement was made with a skilled dairyman, whereby a group of sixteen cows were placed under conditions such as would make possible the development of comparable data. We are greatly indebted to Mr. M. J. Barker of the Beardsley Farms, of Garrettsville, Ohio, and his staff for their splendid cooperation, and painstaking assistance in this work.

Specimens of blood were taken frequently from the jugular veins for extended blood chemical analyses, and samples of milk were similarly analyzed

at frequent periods. Table 1 presents one blood chemical analysis for each of sixteen cows, and Table 2, one set of milk analyses. A control period of about sixteen weeks was utilized in order that levels might be established and individual characteristics noted. Since we have been primarily concerned with calcium metabolism, our blood studies have included total serum calcium, active calcium, diffusible calcium, nondiffusible calcium, serum solubility

served that in only one determination was the experimental error more than 2 per cent.

The milk determinations were made for the purpose of furnishing data in the following factors: specific gravity, total calcium, active calcium, diffusible calcium, nondiffusible calcium, inorganic phosphorus, total phosphorus, sugar, nonprotein nitrogen, total fats and curd tension. The daily milk output was recorded, and, from this, the

TABLE 3.—CALCIUM STRESS OF PREGNANCY
(CASE 1683)*

Date			5/28/26	6/22/26
Calcium per 100 c.c. of whole blood			7.39	9.29
Calcium of serum of 100 c.c. of whole blood	6.89	8.28		
Calcium of cells and clot of 100 c.c. of whole blood	0.50	1.01		
	7.39	9.29		
Calcium of 100 c.c. of serum			9.12	12.22
Calcium of 100 c.c. of cells and clot			1.99	3.16
Cellular calcium per cent of total			6.71	8.29
Calcium of 100 c.c. of plasma (citrated)			8.00	10.42
Diffusible calcium			3.89	5.20
Nondiffusible calcium (colloidal)			5.25	7.02
Cell volume			25.40	22.50
Inorganic Phosphorus			1.25	2.63
Sugar			91.80	.....
Nonprotein nitrogen			23.00	.....
Total calcium balance (negative)			-28.60	-7.8

*Second pregnancy, eighth month. The first resulted in a miscarriage at the seventh month.

factor for calcium, inorganic phosphorus, total phosphorus, sugar, nonprotein nitrogen, total fats, cholesterol, fatty acids and cell volume.

For those who are concerned regarding experimental error in making calcium determinations, a column is added, called "total error present." Determinations were practically always made in duplicate, and often in quadruplicate. The maximum difference in the readings obtained are given in this column, and are shown to be in the order of a plus and minus error averaging 0.85 per cent. It will be ob-

total calcium provided in milk was calculated from the concentration of the calcium in the milk. Unfortunately, space does not permit a detailed critical analysis of the data obtained. This will appear later. This is primarily a progress report. The experiment is still in progress and will be for an indefinite period.

Certain factors are of such importance that they must be noted before passing to the summary of the results. The levels for the various calcium factors of the blood of these cows are strikingly comparable to those of

humans. The nonprotein nitrogen is from a half greater to double that of human beings. The cholesterol is much lower; in many cases, about half. The total blood fats are comparable. The cell volume is approximately the same.

The milk of the cow provides calcium in a concentration approximately ten times that of the blood. The ratios between diffusible and nondiffusible calcium are very dissimilar from those of blood. Inorganic phosphorus of the milk is approximately ten times that of cow's blood, which is approximately twice that of the adult human. The sugar of the milk is approximately thirty times as high as that of the sugar of the blood.

After the cows were kept for about four months on their standard ration, they were divided into groups which received special treatment with regard to activators placed in the foods, and the degree of radiant energy to which the cows were exposed. The normal curve of the total milk production runs along at the maximum for about four months, following freshening, then drops progressively during the following five or six months to a level which is approximately one-third or one-fourth of the maximum for a period of time which is dependent on subsequent pregnancy and intensity of milking. The rate of fall in production is greatly increased by pregnancy. Certain of the conspicuous results of these researches have been changes in the curve of production. In several instances, we have been able, not only to check the normal falling of the total output of milk calcium, but actually to reverse the direction of the curve by producing an increase in total calcium, and this notwithstanding the fact that both the lactation period and the new gestation period were operative in depressing these factors. In several instances, the total calcium of the milk was increased 25 per cent or more. The hardness of the curd has been found to be, in general, quite in proportion to the total milk calcium.

In addition to the blood and milk chemical analyses, biologic determinations were made of the efficiency of the milk for producing growth in animals on deficiency diets, and in preventing and healing rickets-like disturbances in animals on deficiency diets. An evidence of this difference is shown in the following observations on chicks. Ten chicks were placed in each of eight groups, fifty-nine in the ninth group. All received the same deficiency diet, all were the same age and were kept under the same conditions. The group of fifty-nine were protected from all ultraviolet light, and were required to eat by ruby lamp. All but two died in two weeks, or 96.5 per cent, whereas, only 10 per cent of those died which were on this same diet, and received sunshine. The percentage of increase in weight in twenty-three days of chicks receiving the sunshine was 98 per cent. For those receiving the same general diet plus milk from the cow kept in the dark barn without either radiant energy or activator added to her diet, the increase was 89 per cent. The chicks receiving the milk from the cow receiving the ultraviolet light gained in this period 122 per cent. The chicks receiving the milk of the cow which was treated with ultraviolet light plus 2 ounces of activated cod-liver oil daily gained 137 per cent, and the chicks receiving milk from the cow which received 2 ounces of activated cod-liver

oil daily gained 119 per cent. The chicks receiving the ultraviolet light alone in addition to the ascribed diet gained 91 per cent. The chicks receiving raw cod-liver oil with this diet gained 128 per cent. The roentgenograms show differences in calcification in the different groups. These studies are still in progress and will be published in greater detail later, together with histologic bone changes of the different groups. I have given some detail here from one only of several special biologic studies that are being made to determine the relative efficiency of these various factors.

The data already available indicate that it is possible by means of the addition of activators to the diet of cows and by the exposure of the cows to ultraviolet radiation to enhance certain of the growth promoting and antirachitic factors in the animals placed on diets and in environments which have conduced to the development or disturbances in these regards.

An illustration of the changes in the blood calcium in pregnancy, before and after treatment, is shown in Table 3. There was marked physical improvement as would be expected.

TREATMENT

The accumulated data indicate the need for small doses, three or four times daily, rather than larger single doses daily. Two grains of calcium lactate, with 20 drops of raw cod-liver oil in a capsule, three times a day with meals is better than the same total in one dose. Activated cod-liver oil, from 10 to 20 drops, may be used instead of raw, if care is used not to overactivate. One to five minutes in direct noon-day sun in summer or 10 to 15 minutes in winter is sufficient. Do not activate with the mercury vapor lamp without a filter. If activated cholesterol is used, expose the crystals to direct sun for thirty minutes, then place in a good grade of olive oil to make 3 per cent. It is very easy to give an overdose. Give from 5 to 10 drops of this with each meal, with from 2 to 5 grains of calcium lactate. Owing to the length of this paper, extended details cannot be included here. They are accordingly being put in text form.

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A COMMENTARY ON DR. KELLS' CRITICISM OF THE REPORT OF THE CARNEGIE FOUNDATION, AND ON THE EDITORIAL IN THE JANUARY DENTAL COSMOS

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IN the January issue of the *Dental Cosmos*, there appears an article by C. Edmund Kells, D.D.S., and an editorial on this article. The article by Dr. Kells is entitled "A Rambling Review of Some of the High Spots of Bulletin No. 19," Bulletin No. 19 referring to the recent report of the Carnegie Foundation of its five years' study of dentistry. The editorial is entitled "Dr. Kells' Critique on Bulletin No. 19 of the Carnegie Foundation." Notwithstanding the facetious aspects of Dr. Kells' article and his admission in the title that it is a "rambling review," there are several attempts to be serious which may be misunderstood by some who have followed the articles appearing in different journals periodically from our good friend in New Orleans. His loyalty to dentistry has been demonstrated over such a long period that he just naturally takes his pen to do as he says, "repudiate the idea that the college men need reforming." In his characteristically enthusiastic manner of reaching his stated objective, "to try to excite an interest in this state board business, and get the boys a fair deal in the future," Dr. Kells states that "all of the criticisms and suggestions and advice in this Bulletin, therefore, come from those who have never had anything to do with dentistry or dental education on the inside." In other parts of his article, Dr. Kells attempts to discredit the report of the Foundation, apparently because Dr. Gies does not hold the D.D.S. degree. Moreover, Dr. Kells and the editors of *Cosmos* apparently hold Dr. Gies entirely responsible for the content of the report. Technically, the latter is true, but it appears that neither Dr. Kells nor the editors of *Cosmos* read the preface of the report by Dr. Pritchett and the statements of acknowledgment of the receipt of assistance by Dr. Gies on page 241 of the report. In the editorial, we find the following: "It is a layman's opinion that is offered for consideration by the dental teaching group, and as such is open to the qualification of inadequacy." It should be noted that this report is claimed to be from one who is "a layman." Indeed, it seems not to be recognized that some who claim to be good vigorous dentists worked wholeheartedly and sympathetically with Dr. Gies, and that many educators

out of the dental field, officials of universities and other educational institutions, and many others have done the same thing.

In the preface of the report by Dr. Pritchett appears a brief summary of what has been done for the profession of medicine since the Foundation's report on it in 1910. In this discussion in the preface, the following appears:

> This anomaly was fully recognized when the Carnegie Foundation issued its report on medical education in 1910. At that time it did not seem possible to deal with the question of dental education without larger knowledge than was then available. In particular it was not then clear whether dentistry ought to become a specialty of the conventional medical practice, or whether it should remain a field of practice for a separate body of practitioners. This question is entirely independent of the obligation of the medical school to give to all medical students fundamental instruction in oral hygiene and clinical dentistry. Of this there can be no doubt in the mind of one familiar with the subject.
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> The present report is therefore an effort to do for dental education, as it now exists, the same service that the Foundation undertook to perform for medical education—to survey the field, to state the essential facts as they exist today, and to seek to draw such conclusions as may be helpful to those who are concerned with medical and dental education in the United States, and the Dominion. It is to be borne in mind always that this is an educational report, not a technical study of either medicine or dentistry.
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> The study has been carried out by Dr. Gies with an open mind and with the single desire to be of service to the cause of professional education. It has taken five years to complete the work. This has been due not only to the need to obtain exact facts, but also to the long and patient efforts that Dr. Gies has made to understand the situation and to advise with the dental profession. No study of this character has ever been made in which there has been so complete cooperation on the part of the profession itself. The national association of examiners, of practitioners, and of teachers, the national councils on dental education and the dental schools, both in the United States and in Canada, have all lent themselves to this study in a sincere and patient effort to bring out a helpful and wise conclusion. The report is no less suggestive and interesting to practitioners and teachers of medicine than to those of dentistry.

It should be noted that Dr. Pritchett gives credit to what appears to be every organization and interest concerned for cooperation in the study and the obtaining of the material for the report. On page 241 of the report, Dr. Gies makes acknowledgment of a similar nature, with more specific reference to sources of information. The dental schools of this country know that Dr. Gies has taken with him to the schools, at the Foundation's expense, from one to three members of the Educational Council in order that there might be cooperation and mutual understanding between the two. Moreover, I know from experience, and the other members of the Educational Council know from experience, that presidents, trustees, regents, physicians, lawyers, dentists, dental teachers and any and all concerned have been consulted with a view to getting any and all information pertaining to dentistry.

The implication, if not direct accusation, that the report is the product of the work of one person and a "layman," is very much in error. It is the result of the most mature judgment obtainable. If Dr. Kells had not labeled his article "A Rambling Review of Some of the High Spots of Bulletin No. 19," one might be inclined to show in detail how well qualified Dr. Kells is to evaluate properly this report of the Foundation. His designation of himself as a "rank outsider;" his reference to his expectancy to get off with a whole hide; his ref-

erence to his article being a bedtime story, the object of which was to kill time while he was marooned in a hospital; and his reference to his not being a college man, all seem to make unnecessary further reference to his qualifications to criticize a report on what Dr. Pitchett states is a report on dental education. Dr. Kells states, however, that "bedtime story or no bedtime story, this was written with a distinct purpose, or rather should I say two distinct purposes, as you will see."

While the editors take some refuge behind the statement that they have printed Dr. Kells' article in its original language rather than to follow usual custom, they state that they have given the report "careful reading and study." It is more difficult to understand, therefore, why they should allow the influence of one of our best current dental journals, through its editorial columns, to discredit the *whole* report of the Foundation, by discrediting the author of it through the designation of him as a "layman."

There are two very fundamental questions which Dr. Kells and the editors of *Cosmos* and others interested should study and to which they should try to find the answer. They are: Why was the Carnegie Foundation urged to undertake the study of dentistry at this time? and: Why was a person with Dr. Gies' education and experience chosen to take charge of the study? In the preface of the Carnegie report, it is stated by Dr. Pritchett that "it was not then clear whether dentistry ought to become a specialty of the conventional medical practice, or whether it should remain a field of practice for a separate body of practitioners." Those who are at all familiar with dental education in most foreign countries know that the principal fundamental difference between dental education in those countries and in the United States is that it is a part of medical education in the foreign countries and an independent profession in the United States. Since students of practically all branches of science, literature and the arts have been going to foreign countries to finish their education for many years, it is, until one understands the situation, a logical question for a president or other officer of a university to ask why dentistry should not be a part of medicine in this country as it is abroad. Unless our friends, Dr. Kells and the editors of *Cosmos*, give the same consideration to this question that Dr. Gies and the Foundation and some of the rest of us have given it, they are not in a position to evaluate either Dr. Gies' ability to conduct the study or the results of his work. Those in control of the better educational institutions of this country have given this question serious consideration for many years and have not been able to reach a decision largely because the dentists have been unable to convince such authorities that dentistry in the United States has developed in its health service aspects beyond what it is in most foreign countries because it is an independent profession in the United States. It is not strange to have a profession develop further when independent than when subordinated to other specialties, but dentists generally have not been able to convince the educational authorities of this country that dentistry should *always* be conducted as an independent profession. Whenever educational authorities are confronted with requests for appropriations for duplicate departments for medical and

for dental schools for the fundamental subjects, they are compelled to ask why there should be separate departments for these fundamental subjects and to urge an answer to the question as to whether dental education in foreign countries is not more efficient and economical than in the United States. If Dr. Kells and the editors of *Cosmos* could stretch their imagination far enough to visualize separate departments in schools of dentistry for anatomy, histology, embryology, physiology, bacteriology, biochemistry and pathology, they would have an idea of what exists to some extent yet, and existed much more only a few years ago, in most dental schools in this country. Having once visualized the situation, is it strange that everyone charged with educational and financial responsibility should urge an answer to the question: Why is so-called American dentistry independent of medicine when it is generally known that much of science, literature and the arts has been brought from foreign countries? I am afraid that our friends, Dr. Kells and the editors of *Cosmos*, have overlooked the fact that it is not the dentists and dental teachers of this country who are most vitally interested in the report. It is those who have charge of our leading universities who have, in many cases, been voluntarily negligent with their dental schools because they were neither convinced of dentistry's worth as a health service nor did they understand why it should remain an independent profession. It is easy to understand why our friends, Dr. Kells and the editors of *Dental Cosmos*, are inclined to discredit Dr. Gies on the grounds of his not holding a dental degree, and it is equally easy for some of us who have been dealing with university authorities for over a quarter of a century to understand why Dr. Gies was chosen. Dr. Kells has spent about a half century in practice, and the editors are engaged in neither practice nor in teaching, and are not familiar with the most urgent reasons for a study of dentistry; while the Carnegie Foundation is a national organization of those skilled in making studies of this kind and known to be interested in the general welfare of the public. Moreover, the nature of Dr. Kells' and the editor's discussion would seem to indicate that both Dr. Kells and the editors had overlooked the statement in the preface by Dr. Pritchett that this is an educational report and that the conclusions are significant for both medicine and dentistry. Naturally, the Foundation chose a man who was skilled in making investigations. For thirty years, Dr. Gies had been a teacher of biochemistry and a research worker in Columbia University, this experience giving him unusual acquaintance with medicine and medical teaching. For many years, he had been doing research work on problems of combined medical and dental interest, and since 1914, he had taken part in the organization of the dental school at Columbia University. His educational qualifications are, beyond a question, sufficient for the most exacting and difficult study. He holds B.S., M.S., Ph.B. and Ph.D. degrees that he has earned, and Sc.D. and LL.D. honorary degrees. His list of accomplishments, as indicated briefly, in "Who's Who," shows that he has been a tireless worker with the educational instruments that he possesses. With the long list of responsible positions that he has held and the preparation outlined, is it

any wonder that an organization such as the Carnegie Foundation made the choice that it did? Moreover, will Dr. Kells and the editors give consideration to the fact that the future of not only dental education, but also all education depends on what the universities of this country do? Then, will they visualize themselves in the position of president or trustee of a university, and then state whether they would rather have Dr. Gies, or some other person with similar qualifications, make a report to them on what to do with their dental school, or whether they still feel that some dentist would make a better and more impartial report?

It is interesting that one of the most significant things about this admittedly "thorough and careful" report by one who is said not to be qualified to make a report because he is not a dentist should escape the attention of both Dr. Kells and the editors of *Cosmos*. Please note that Dr. Kells states, page 53, that "this bulletin consists of no less than 692 pages, the result of a most thorough and careful examination into the conditions of each of our forty-three dental colleges. It is a wonderful work." Also note the following significant statements by Dr. Kells: "Professor Gies has charged the state boards with being unfair, and while it is awful to believe that such could be the case, yet it looks as though he has sustained his charges. . . . In the next place, as I said in the beginning, Brother Gies sure did 'razz' the state boards and, much as I regret it, it looks as though they got what was coming to them, and I am glad that he did give them such a wicked 'hand out.'" Evidently, Dr. Kells regards this "layman," selected by the Carnegie Foundation to make this study of dentistry, capable of uncovering some defects in the work of the state boards. Indeed, he even indulges in the use of the intimate term "Brother Gies" when the subject matter coincides with his views. When the subject matter in question does not coincide with his views, he cannot imagine how anyone could have such a vivid imagination as to think for one moment that any of our dear public will give "Reforms in Dental Training" a second thought. At least, this is what his "Rambling Review" seems to imply.

My curiosity is aroused, and I should like to know whether Dr. Kells would not also agree with the following extracts from page 16 of the preface of the report by Dr. Gies to the Foundation: "Dentistry is an important branch of health service and cannot longer be ignored in the training of general practitioners of medicine." . . . The practice of dentistry cannot now be made a specialty of the conventional practice of medicine, but should remain a health service of equal recognition with other specialties of medicine." No other equal number of words ever written on any dental subject carry with them such significance to dentistry. Let us suppose, for example, that this "layman," as Dr. Gies has been designated by Dr. Kells and the editors of *Cosmos*, had recommended to the Carnegie Foundation that dentistry in this country give up its independence and become a part of the medical schools as it is in most foreign countries; and that the Foundation had reported to the entire educational world that it concurred in the recommendation. Let us visualize, too, the situation of half of the dental schools in this country that were loosely affiliated, or unaffiliated with universities

when Dr. Gies began his work, and the fact that more medical schools in this country did not have dental schools affiliated with them than did have them. Furthermore, let us assume that the Foundation had proceeded to do what it says it intends to do, "do for dentistry what it has done for medicine," by advising those who may give to dentistry, as others have given to medicine, to give it to those schools which were integral parts of medical schools. Under these conditions, do Dr. Kells and the editors of *Cosmos* doubt that, in ten years, dentistry in this country would have been on the same basis as it is in foreign countries? Do they think that the new dental schools that are certain to be organized as parts of universities which have medical schools and no dental schools would be organized without due consideration for the recommendations in this report? Do they suppose that the dental schools which have become affiliated with universities since Dr. Gies began his investigation for the Foundation would have found the universities involved recognizing their obligations as they have done? and do they not realize that the remainder that are without university affiliations will find their course much easier? I wonder if Dr. Kells and the editors of *Cosmos* regard the settlement of this problem the most fundamental one, the most far-reaching and the most beneficial to dentistry, one of those to which they refer as "reforms in dental training" which "should not be given a second thought" or "be regarded as unjust and unfair" by the dear public, as Dr. Kells says, and one which will not receive "unqualified general acceptance," as the editors say.

There is little doubt that both Dr. Kells and the editors rejoice with the rest of us that the results of the study by Dr. Gies confirm the opinions held by dentists generally, from dentistry's inception, that dentistry constitutes a useful form of health service equal in many respects to some of the specialties of medicine. Unquestionably, they are willing to attribute the success of American dentistry as a health service largely to its independence. Their loyalty to these beliefs, and to the belief that dentistry has proved its worth in the face of many obstacles, apparently makes them resent being told anything about dentistry by anyone who is not a dentist. They not only resent being told anything, but they also overlook some of the most fundamental things in the report in order to find something which seems to justify their resentment.

Educational authorities, dentists and others concerned should not consider such criticisms as those submitted by Dr. Kells and the editors seriously, for it has been the history of nearly every reform that was ever proposed that it was opposed by some of those who should have supported it and by those most effected by it. Opposition to changes and especially to reforms is a natural expectation. Pasteur, the chemist, found himself in the same predicament when he attempted to tell the physicians something about the germ theory of disease in 1860; and from that time to the present, one may find a continuous chain of evidence that opposition to changes is a perfectly natural expectation. If it is not for one reason, it will be for another; and it seems certain that a person of Dr. Gies' experience and education knows these tendencies of the people too well to be

much exercised about them. The address of Roscoe Pound, dean of the faculty and professor of law at Harvard Law School, delivered to the Chicago Bar Association, Nov. 12, 1925, and printed in the *Commercial Law League Journal* for May, 1926, gives some interesting information about the recent attempts to have the profession of law meet its obligations, and is suggested for consideration by Dr. Kells and the editors of the *Cosmos* and others concerned. The following from Dean Pound's address is a rather long extract, but it has such a direct bearing on the subject that its use seems justifiable. He says:

> Our own relatively short history tells the same story. The Constitution of the United States is one of the outstanding documents of Anglo-American law. It is justly revered by the lawyers of today. But when it was first drawn and was submitted to the people for ratification, it encountered the most determined opposition from the leaders of the profession. The lawyers who favored it were young and of little experience or standing. Eloquent speeches against it were made by lawyers whose fame still endures. Moreover, the grounds of their objection were that the instrument would be dangerous or even fatal to liberty; whereas today lawyers have come to recognize it as the chief safeguard of liberty. Again it is instructive to read what lawyers had to say when married women's acts were first proposed; what they had to say when statutes first gave rights to mothers with respect to custody of their children; what they had to say when homestead laws were first enacted and what they prophesied when common-law procedure was overhauled in the middle of the last century. To come to recent times, we need to compare with the foregoing the report of a group of eminent New York lawyers when a project for amendment of the state constitution, so as to admit of a workmen's compensation act, was before the people of that state. Truly, not the least warning of legal history is one against confident prophecy of disaster when changes are made in the law. The very spirit of the profession that leads to these prophecies is our best guaranty that they will not be fulfilled.
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> In law as everywhere else, we must rely upon those who know the problems to be met, know the materials, and know something at least of the experience of the past out of which those materials have been wrought. And yet, so long as lawyers persist in an attitude of juristic pessimism—so long as they decry the doing of things by laymen and do nothing themselves—we must expect the public to strike out blindly in the endeavor to do the best they may, when bad situations arise and are suffered to continue. Ours is not the only profession which from time to time has had to be reminded that it is a practical profession charged with attaining practical results. Charlatans and quacks and miracle workers have more than once had to wake the medical profession from a period of pedantic dogmatic slumber. The military profession has been rudely awakened more than once when volunteer non-professionals have led the way while professionals were waging wars of the present with the tactics and armament of the past. It has happened more than once that a movement from the outside has led to advance in naval operations, when the professionals had become fixed in an obsolete routine.

Later in his address, Dean Pound stated, while discussing the practical importance of pure science, that "lawyers must learn what we have had to learn in every other practical field of endeavor," etc.; and at the conclusion, he stated that "what research has done for the prevention and cure of disease, what it has done for engineering, and the technical arts, and agriculture, and business administration, it may yet do for the law." Were such admonitions from the pen of one with less reputation as an exponent of legal research as a cure for some of society's ills, we might be inclined to give them scant consideration. Such is not the case; for the Harvard Law School with its able leader has interested the leading universities of this country in maintaining departments of legal research as a pro-

tection against the enactment into law of hastily formed judgments and views of visionary radicals. The law schools are out on a program of reform and improvement, and they propose that they shall learn from the other professions all that they can. Now, my dear Dr. Kells and the editors, are we dentists any differently situated from the lawyers of this country in this respect? Is it not quite probable that dentistry, a young and undeveloped profession, may learn from other branches of education? At least, the educational authorities of this country wish to hear what an impartial and well qualified organization thinks about this new unit that has, since 1839, been proposed as an integral part of our universities. It seems that the greatest service ever performed for dentistry has been performed by the Foundation and Dr. Gies, by making it clear, with detailed analysis, to the educational authorities of this and other countries, that public welfare requires that universities put dentistry on a strong basis educationally; that medicine should recognize dentistry as an important branch of health service and should cooperate with it, and that dentistry should remain an independent profession. If there were no other things of value in the report than these pronouncements by an influential, impartial body, they would, in themselves, constitute a benefaction to dentistry greater than any other. It is the educational institutions of this country and the public who are most vitally interested in these statements by the Foundation. Dentistry has been proclaiming them since its inception, but they have not been generally accepted. Is it not possible, therefore, that this so-called "layman's" influence will be greater with these educational institutions and the public than that of the whole body of dentistry?

HISTORY OF DENTISTRY IN BELGIUM*

By O. RUBBRECHT,† Ghent, Belgium

THE only law concerning dentists or dentistry in Belgium is that of March 12, 1818. There, it is said that the attestations of capacity for the profession of dentist must be delivered by the provincial medical commissions. Several royal decrees completed this law. They are dated May 31, 1880, Dec. 30, 1884, April 24, 1899, Aug. 14, 1899, Aug. 24, 1918, May 5, 1919, July 21, 1921, and March 10, 1924.

The royal decree of Dec. 30, 1884, was the first which determined conditions for admission to the examination of dentists. According to this decree, the candidates had to spend two years with a qualified practitioner of dentistry and pass an examination, on an elementary matter, before a board of examiners nominated by the provincial medical commissions.

In the same year, 1884, professional life in dentistry awakened in Belgium with the foundation, by Dr. Quinet, of a private dental school, the *Institut odontologique de Bruxelles* and a dental review, the *Revue odontologique de Bruxelles*.

Dr. Rosenthal places the foundation of the *Association générale des Dentistes de Belgique*, the first, according to him, to be established (it was really founded fifteen years later, in 1898), and of the *Société belge d'odontologie* in the year 1883.

As a matter of fact, the first Belgian dental society, the *Société odontologique de Belgique* was founded, Dec. 7, 1884. The *Revue odontologique* became its organ. This society, in 1886, addressed to the Royal Academy of Medicine of Belgium a memorandum, written by the Drs. Quinet and Van Blaeren, on the organization of dental studies, and presented a curriculum which, at that time, was of the very best. This curriculum was, in its principal lines, adopted by the Royal Academy of Medicine at its session of September, 1886.

The *Société odontologique de Belgique* was, at the moment of its foundation, composed of seventeen members, among whom were two doctors of medicine. Dissensions arose in it from the very beginning and spread rapidly. Shortly after the combined efforts of its members had won success, the disagreement became acute. Dr. Quinet retired from the society at the end of 1886. His resignation was soon followed by the discontinuance of the *Revue odontologique* and thereafter by that of the society.

The Board of Council for improvement of higher instruction, at its session, Dec. 27, 1887, adopted unanimously

*Discussion of a paper by Edmund Rosenthal, published in THE JOURNAL, October, 1927.

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the decision of the Royal Academy of Medicine concerning dental studies.

Shortly thereafter, a complete reorganization of the conditions for admission to the universty and the curriculums of the universities took place. This offered a splendid opportunity for obtaining the legal approbation, by the parliament, of the program of dental studies adopted by the scientific organizations above mentioned. Unfortunately, there was, at that time, not a single dental society, not a single dental paper, not a single center of activity whatsoever that could convey to the government the requirements of the dental profession.

Laws on the academic grades, voted, April 10, 1890, and July 3, 1891, did not mention dentistry. So passed, without advantage being taken of it, an opportunity for this science to attain at once a high standard. Until today, such an opportunity has not reoccurred. Thus it happens, in the history of nations, that one single moment decides one's fate for many years, and often for centuries.

The most important facts here mentioned escaped Dr. Rosenthal.

In 1898, the *Association générale des dentistes de Belgique* was founded in Brussels.

A royal decree, dated April 24, 1899, replaced the obligation of a two-year period with a dental practitioner by the regulation that the candidates for the diploma of dentist must possess the legal diploma of a candidate in medicine.

Dr. Rosenthal writes: "This complete change was decided on by the ministry on education. It was not the office of the minister on public instruction to intervene in this matter. Belgium is in a very peculiar situation in this regard. While, in nearly all civilized countries, the teaching of dentistry comes under the Ministry on Public Instruction, in Belgium the conditions for admission to the dental examinations are in the hands of the department of hygiene. In 1899, this service came under the Ministry on Agriculture, so that the royal decree of April 24, of that year, concerning diplomas of dentists, is signed not, by the Minister on Public Instruction, but by the Minister on Agriculture. The complete independence of dentistry from the hygiene service is a consequence of the law of 1818. The knowledge of this fact is very important for the understanding of dental evolution in Belgium.

Dr. Rosenthal writes further that, from 600 dentists existing in Belgium at the time of the promulgation of the decree, the number fell to 450, and that this did not change in the least the opinion of the authorities, who remained immovable.

An official document dated July 9, 1899, shows that this is not possible. This document establishes that, Jan. 1, 1898, 376 dentists existed in Belgium and that, every year, from 1893 to 1897, thirty-one new ones succeeded in passing the examination. We are here far from the 600 practitioners spoken of by Dr. Rosenthal.

In August, 1900, two congresses interested in our specialty, took place in Paris: the Third International Dental Congress and an international medical congress, with a section on stomatology. A great number of Belgian in Paris, practitioners met, thanks to this opportunity.

A few of them, enthusiastic regarding what they had heard and seen in

Paris, tried to found a dental school on their return to Belgium, but they did not succeed.

Another consequence, and a very important one, of the meetings in Paris was the foundation, in November, 1900, of the *Société odontologique des docteurs en médecine de Belgique*, which became a short time later the *Société belge de stomatologie*.

From this date, there have existed in Belgium two distinct professional tendencies, which worked on two distinct lines for the raising of the profession. The one was represented by the odontologic group, inspired by the autonomist ideal; the other one, by the stomatologic society, endeavoring to obtain the assimilation of dentistry with all other medical specialties.

In 1901, two reports were sent by the stomatologic society to the government and to the medical faculties, in order to obtain the organization of dental studies in the medical faculties. In many other respects, this society displayed great scientific and professional activity.

A medical man (now dead) who was, in the capacity of inspector, attached to the department of hygiene, assisted regularly at the sessions of this society, though not a member of it. This man, in 1902, started a campaign, clamoring *urbi et orbi*, that any medical man should be able to learn dentistry in about fifteen lessons; that he himself was capable of teaching any doctor the remunerative profession.

This campaign, far from being the origin of the stomatologic movement in Belgium, as it is represented by Dr. Rosenthal, was vigorously opposed from its beginning by the stomatologic society. The absurdity of its teachings soon became evident to every one. This campaign constitutes only an incident, an outgrowth of little importance in the evolution of Belgian stomatology.

The *Bulletin de la Société odontologique des docteurs en médecine de Belgique*, which became later the *Revue belge de stomatologie* began publication in 1903. This review appeared regularly from that time on.

In consequence of the activity of the Belgian stomatologic society, the teaching of stomatology was instituted in the medical faculty of the Universtiy of Louvain, in 1905. From that time, stomatology was in this university, placed on the level of all other medical specialties.

The *Journal dentaire belge* appeared in 1909 as the organ of the Belgian National Dental Federation and its component societies.

A school of stomatology, the *Institut belge de stomatologie*, was founded in 1912, in Brussels, by a group of stomatologists. This institution had nothing to do with the campaign spoken of above. Thus, it should not be said, as Dr. Rosenthal states, that the medical men who adopted dentistry as a calling found that it took more than four or five lessons to make a perfect dentist from a medical graduate and so founded a school of dentistry, called the school of stomatology. This institution has published regularly, since 1912, the *Annales belges de stomatologie*.

The same year, the *Ecole dentaire belge* was founded, under the auspices of the Belgian dental federation.

In March, 1914, the teaching of stomatology was started at the University of Ghent.

In August, 1914, the World War

burst upon us. Dr. Rosenthal complains about the Belgian soldiers who "had to endure torture from toothache without any hope of help, which was unobtainable, being practically nonexisting." In the Belgian army, as in most of the other armies, dental service was in the beginning, insufficient, but great improvement was soon made in this direction. If our soldiers could not always have complete dental care in the sanitary services of the army divisions, they could at least obtain there relief from their pain. Filling of decayed teeth and the placing of artificial ones were also included in the sphere of activitiy of the divisional dentists.

Besides the dentists of the army divisions, there were, at the Belgian front and behind the lines, an excellently organized ambulance service. Stomatologic service was afforded in nearly all these. The activity of some of them was limited to ordinary dental service, while in others the best efforts were spent in every kind of dental work and in maxillofacial restoration. These services can be placed among the best existing anywhere.

Teaching of stomatology was instituted, in 1920, in the medical faculty of the University of Liége.

A royal decree of July 21, 1921, modified the conditions of admission to the examination of dentist, adding the obligation of two years special studies to the diploma of candidate in medicine required by the decree of 1899. A commission had been nominated in order to prepare this new royal decree. This was only a consultative commission, of private character, not officially nominated by the government, which was in no manner bound by the conclusions of the commission.

A complete revision of the laws on academic grades is expected in Belgium in the near future and has already been voted by the senate. This provides for the completion of dental studies in five years, with a diploma of licentiate in dental science.

SUMMARY

If progress came slowly in the evolution of dentistry in Belgium, the fault lies chiefly in a lack of organization of the profession. The first dental society was formed in 1884, but ceased to exist in 1886.

Only in 1898 did professional dental life awake again. From that time on, great progress has been made. Several schools of dentistry or stomatology are open to students and give them every opportunity to receive excellent training.

From a purely odontologic point of view, the only important need is that of a law which would shorten the time actually required for obtaining a dental diploma and create a title sounding somewhat better than the rather discredited title of dentist. It may reasonably be expected that such a law will be voted before long.

SOMETHING NEW IN CLASPS*

By GEORGE M. BUDLONG, D.D.S., Clermont, Florida

I WISH to call attention to a clasp for partial dentures of my own design, which I believe will prove of benefit to the profession generally.

In this clasp, the common fault of rigidity is entirely overcome, putting the least possible tension on the abutment tooth. Such stresses as occur through use of this clasp are almost entirely on the long axis of the tooth, rather than lateral stresses which act as orthodontia appliances. The clasps of Nesbett, Roach, Akers, *et al.*, while functioning satisfactorily for teeth which are in line, tend to bring undue stress on teeth which are not parallel to each other. This type of cases predominates.

The clasp which I have perfected is as easily applicable to teeth out of alinement as to those that are regular, and the support is as effective. It makes no difference whether the abutment teeth have moved buccally, lingually, mesially or distally, as the clasp is so flexible that a perfect hold is obtained under all conditions, with no more than ordinary ingenuity.

I am still wearing the original clasp of this design in my own mouth, and it has never required the least adjustment or alteration, after eight months' use. During this time, I have used this type of clasp exclusively in my practice, and I have never seen an abutment tooth so badly tipped in any direction that it was impossible to clasp to it firmly, easily and with perfect comfort to the patient.

I have found one instance in which the nearest abutment tooth was so sensitive that I extended the bar of the clasp to the second tooth from the denture with no more trouble than in the ordinary cases.

The clasp is constructed entirely of 16-gage round platinum-gold clasp wire, and is made in two parts. The clasp proper seats itself in the embrasures, taking full advantage of the mesial and distal bulges. The first step in its construction is to bend into horseshoe shape about one-half inch of the wire to fit roughly the abutment tooth. The wire is then flattened on an anvil with a hammer to about half its original thickness. It is then fitted to the contour of the tooth flatwise, so that the tips are in contact with the abutment tooth. I would stress here the point that the fingers of this clasp should grip at the ends, and these are the only points of contact with the tooth, except whatever support is given on the lingual side of the tooth.

It is important in preparing the bar which joins the clasp and the denture that a slight bend be made near the end of the bar wire. This bent end is filed or ground until it is not quite flush with the shank of the wire, after which, by use of laboratory soldering clamps, the filed end of the bar is soldered to the abutment tooth clasp.

*Exhibited at the meeting of Florida State Dental Society, St. Petersburg, Fla., Nov. 10-12, 1927.

The bar is then bent at right angles about one-sixteenth inch from the clasp, runs along the alveolar process for about three-fourths inch, makes a right angle turn up over the ridge, and then another right angle turn back to the tooth, going up to form the occlusal rest.

The foregoing applies to all vulcanite dentures. When the gold base is used, it is soldered at the first contact to the bar with the base.

This clasp can be disengaged almost instantly by the patient pulling outward and downward with the finger nail at the angle of the bar nearest the clasp proper.

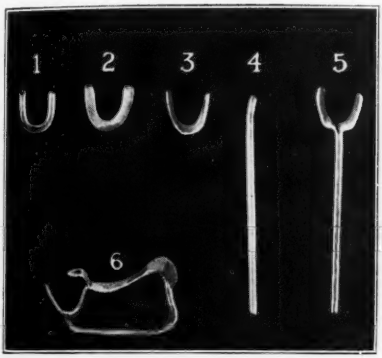

Fig. 1.—*1*, horseshoe-shaped round wire; *2*, wire flattened on anvil; *3*, wire bent flatwise to conform to shape of tooth; *4*, straight piece of round wire with shaft bent slightly at end; *5*, straight wire soldered to clasp; *6*, completed clasp, later applied to cast as shown in Figure 2.

Fig. 2.—Clasp applied to cast in which abutment tooth had an extreme leaning buccally. The long flexible bar permits the clasp to slip past the mesial and distal convex surfaces.

NONDEVELOPMENT OF THE ENAMEL: REPORT OF A CASE

By B. CARL HOLDER, D.D.S., Corpus Christi, Texas

The patient, aged 4 years, the second child of three children, was a well developed, normal child, except for the fact that the enamel was lacking on all the teeth.

The superior and inferior maxillary bones were well developed. All the deciduous teeth were present. The anterior teeth were conical in shape; the posterior teeth were even and level with the gums and presented perfectly flat occlusal surfaces. The dentin appeared to be glazed, giving the appearance of fused glass. The ameloblasts had failed completely to function. On close examination, the pulpal chamber could be seen as a small white spot.

The child had complained only once of the teeth being sore. The upper central incisor and the left cuspid were abscessed, with the fistula situated labially.

The mother, aged 22, was apparently in good health. Her diet had been the same throughout the three pregnancies. The two other children, aged 2 and 6 years, had perfectly developed enamel.

To me, the case is unique. Perhaps others have seen the same condition.

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Editorial

TWO OPINIONS

It may be considered fortunate that all people do not think alike. It would probably be a very monotonous world if this were the case; but sometimes people think so diametrically differently that they would seem not to belong to the same species. An instance of this kind is illustrated by the receipt of two letters in the editorial office concerning the February issue of THE JOURNAL. One was as follows:

My dear Editor:

I am at a loss to understand why we have to keep on reading articles in THE JOURNAL presented at dental societies nearly two years ago. I for one am not interested in papers read at dental societies two years ago, and I am wondering how many of the dental profession are interested. I pick up THE JOURNAL of February, for instance, and the first article is "The Enamel Margins for Fillings," with a footnote stating, "Read before the Section on Operative Dentistry at the Seventh International Dental Congress, Philadelphia, Pa., August 26, 1926." Too old for me, and I was one of the many who could not attend the Philadelphia meeting.

To which the editor replied:

My dear Doctor:

Your letter of February 7 is received. It is perfectly natural for readers to object to delay in the appearance of papers, and no one regrets this delay more than the Editor. But there is usually a reason for everything under the sun, and there happens to be a reason for the delay to which you naturally object. You refer to a paper read before the Congress in 1926. At the close of that meeting, we had turned over to us about three hundred papers, and the officers stated that if we got the proceedings out in two years we would be doing well. During 1927, we published more than two hundred Congress papers, and are just nearing the end of the Congress material. When we get that out of the way, we shall be able to use papers more promptly, but it will always be found that delays will occur no matter how anxious the Editor is to get early publication.

Frequently, papers are not turned over to us immediately following a meeting, and there are many reasons for delay over which the Editor has no control. It would of course be well if papers could appear in print immediately after being presented to a society, but that is not practicable.

The problem of handling material as it comes in to THE JOURNAL is not an easy one, and there are difficulties of which the reader cannot have the least conception.

Some time when you are in Chicago please call at the editorial office and we will show you the routine. If you will do this, I am sure you will have greater charity for our delays.

With best regards, I am

Most cordially yours.

The heartache had scarcely had time to heal when the following letter about the same issue came to the office:

My dear Dr. Johnson:

I have carefully gone through and read a large majority of the matter the February number of THE JOURNAL contains; and while I have been a reader of dental literature more than thirty years, I can truthfully say that, in my opinion, I have never found so much *good stuff* assembled in any one number of any dental periodical. I am going to read many of the articles again, as they are filled with "*meat.*"

I congratulate you on such a compilation; and congratulate the profession, on having such a worthy publication. Please accept my personal thanks.

Sincerely yours.

We ask the reader to take his choice of these two letters, at the same time assuring him that he would never have been asked to read either of them were it not for the fact that they throw such a vivid sidelight on the problems and rewards that daily come

to an editor. The only comment that we wish to make is that, in the various limitations with which an editor's efforts are necessarily surrounded, there is no one who suffers so much regret as the editor himself. It may also be said, in passing, that when a letter like the latter is received, it puts new life, new purpose and new resolve into the editor's heart, and inspires him to do better and still better work.

THE CHANGING SEASONS

Who would wish to live in a land where the climate was the same the year round? Not I. My friends in the South—bless their hearts—write me in a commiserating way about their roses in midwinter. All right; let them have their roses; I am glad they enjoy them; but I do not want them to insist that I enjoy them. I of course love roses—I would be a heathen if I didn't—but I want them at their proper time. I don't want them to force matters and intrude themselves in such an unseemly way out of season. I have my doubts about roses or any other flowers that bloom when they shouldn't. It always seems to me like trying to "show off" a bit, and not succeeding very well.

In passing, the South is a beautiful and entrancing place for those who live there. I love the Southern people and I am glad that they have the kind of a country and climate they want. But it does not happen to be the kind I want. When they write me about roses in January, I wonder. I just wonder if they have ever felt the stimulating sting of sleet beating against the cheek, or enjoyed the glory of it! Have they ever reveled in the supreme luxury of fighting a wild snow storm with the swirling drifts spanking the face in boisterous frolic, and bringing the freshness and glow of health to the cheek? Oh, the grandeur of a big snowstorm! Roses in January! I'll wait till spring for them if only I may have the invigorating blessing of winter.

And then about the time winter begins to be a bit tiresome and we have had enough of her strenuous embraces, she begins to relax and yield her dominion to the gentler sway of spring. What

is more wonderful than the sudden burst of spring when the whole of nature takes on a regeneration and the very air vibrates with happiness! Everything is being born again. There is no such miracle anywhere as there is in spring—no such renewal of life—no such growth. Spring is the great emancipator, the great liberator. The unfortunate inhabitants of the tropics never dream of anything so marvelous. They sometimes talk about spring, but they do not know what spring is. How can they when they have no real spring? Their attempts at spring are a mere feeble make-believe, a sort of faded-out counterfeit, a pale and pathetic substitute.

Just to go out and watch the buds unfold is enough to make one worship. The mysterious mellowness in the air soothes the nerves and sanctifies the whole being. There is a real purification about it, a rejuvenation. Something ethereal creeps into the atmosphere, and makes it pulsate with new life. The nostrils drink it in as if it were an elixir, and it makes the blood tingle. The sap runs not only in the maple trees but in every living thing, and the spell of new life permeates it all. If any evil ogre should ever take spring out of the seasons, it would rob life of half its joy.

And then the summer, the blessed summer with its bounty and its beneficence, furnishing the means of sustenance for man and beast; the great provider of the universe; the harvest time of the seasons, when the fields of yellow grain wave across the landscape and presage of plenty in the days to come; when growth and fulfilment are everywhere manifest; when hope is high and fruition is certain; when the very joy of life is in the air, and the hearts of men are happy—what can be finer than summer! Little wonder that summer is hailed by the multitudes. It is the vacation time of humanity, the exodus to the woods and waters, when hats are tossed aside, and peals of laughter make music in the air. Prodigal in everything, summer spreads her blessings with lavish unconcern, and waving her magic wand across the landscape of the world, she bids the sons of men to enter in and possess.

Summer is the great consummation. All the hopes and aspirations of spring are made manifest—the green is turned to gold, the fledglings are flying from nests, the mammoth wagon-loads of grain are swaying across the fields to the barn, the cattle are fattening in the meadows, and the fruit is ripening in the sun. There is an air of providing for the future—Nature smiles and is content.

And next comes the autumn, stealing softly over the senses, and bidding us to halt—and think. The first delicious melancholy of the receding year, the quieting down of Nature, the subdued hush of the elements and the hesitating pause before the advent of winter—all of these tell us that autumn is here. The leaves begin to flutter to the ground, and the fall flowers bravely show their best colors, daring the world to say that they are dying. The trees in the woods and along the roadside begin to take on the marvelous coloring that we get only in autumn. The glory of the maple woods! All of the shades from a pale receding green to the most vivid red, with splashes of color to contrast with the darker foliage—the glory of the thing can never be described by pen or painted by brush. Nature is the greatest artist of all, and in autumn, the picture is spread before us in such magnificence and grandeur that it almost stops the breath. Every time I look at a beautiful tree, I instinctly want to take off my hat in veneration, and the autumn foliage is by far the most glorious.

And when the first eager nip of frost comes to tingle the cheek and brighten the eye, how delightful it is to gather by the fireside in the evening and snuggle! To sit in the twilight by the open grate, and gaze into the glowing embers and muse, and muse, and wonder for once "what it is all about"; to settle into the embrace of a great arm-chair in a purry way and abandon oneself to the luxury of perfect relaxation—what can be half as soul-satisfying as this! Who would want to do without autumn!

And thus the seasons come and go, and each one brings with it its own special message, its own appeal, its own rewards, its own allurements. Who could spare any of the seasons? Even if cer-

tain of them exact a slight penalty, they all bring their rich rewards and their never-ending interest. And the most fascinating thing about them is their constant change.

Roses in January! All right—for those who want them at that season.

PUT A PUNCH IN YOUR WORK

When you attempt to do anything, do it with all your heart—put a punch in your work. To dawdle over a duty is to fall short of reaching the goal. If a thing is worth doing, it is worth doing with a will. The spirit you put into your effort is the significant thing—half the battle is to get well under way. Hesitation and uncertainty are fatal to the best achievement: to pause is to lose momentum. Look a problem in the face and tackle it: do not hide your head in the sand and pray for help. The best help you will ever get comes from your own resolution—your resolve that the thing needs to be done and that you are capable of doing it. Timidity and indecision are a handicap. Courage, self reliance, determination and vigor are the talismen which open the door of opportunity and let you walk in and possess. Many a man has had the ability to do things but lacked the initiative to live up to his capacity. If a difficult duty presents itself, do not sit down beside it and ponder—snap into it. Before you know it, the thing is done. Most problems may be solved in the time that some people stop to wonder and to consider them. A good start is the best tonic; to keep up the pace is the best policy. Put a punch in your work, and your work will help to do itself—it will become play.

BUREAU OF DENTAL HEALTH EDUCATION

DENTAL INTERNSHIPS IN GENERAL HOSPITALS OF UNITED STATES, CANADA AND PHILIPPINES*

By SIGMUND W. A. FRANKEN,† D.D.S., and GEORGE F. SAUER,‡
New York City

A PRELIMINARY report of general hospitals offering dental internships was published in March, 1927.[1] The material for it was compiled from a list of hospitals in medical internships.[2] Only those having 100 or more beds were selected. Our replies at that time were 268, out of 475 questionnaires sent. To Nov. 1, 1927, these replies have mounted to 281, or a trifle over 60 per cent, which merely goes to prove the vital interest being taken in this subject. Mention is constantly being made of the need of dental internships in general hospitals, and the retiring president of the First District Dental Society of New York, J. T. Hanks, suggests that the society should advocate the establishment of dental internships.[3] The Academy of Medicine, in its pamphlet on postgraduate instruction, has given a list of hospitals having dental internships.[4]

No one has argued against the employment of dental interns. Here and there, the need of them has been mildly discussed. The young graduates in dentistry each year seem to be more and more interested in obtaining such an internship, but the big question is "Where can the information be procured?"

As far as we know, there has never been any list from which the necessary data could be obtained. The usual course is for the ambitious graduate to write to some of the hospitals of which he may have heard, and, in these letters of application, it is usually very discouraging to see the lack of understanding. The applicants do not seem to know the difference between an ex-

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†Attending Dentist to the Lenox Hill Hospital.

‡Superintendent of the Lenox Hill Hospital.

1. Franken, S. W. A., and Sauer, G. F.: General Hospitals Offering Dental Internships: Preliminary Report, Dent. Cosmos, 69: 297 (March) 1927.

2. Hospitals Approved for Internship (Hospital Number), J.A.M.A., 84: 971 (March 28) 1925.

3. Hanks, J. T.: First Dist. Soc. Bull. (New York), 8, No. 1 (Oct.) 1927.

4. Opportunities for Clinical Study in Hospitals of New York City. (Pamphlet issued by New York Academy of Medicine, compiled by Frederick P. Reynolds, medical secretary.)

tern and an intern. Many of them are under the impression that any sort of outpatient department work comes under the head of dental intern duties.

Before reading the tables, it is well to establish firmly the fact that terms borrowed from medicine should have the same significance in both professions. A dental intern is a graduate of the current year who, for a definite length of time, devotes himself entirely to hospital ward patients, sleeping at the hospital, and having the same standing as the medical intern.[5] A dental extern is one who devotes either a few hours or the entire day to the hospital ward patients. He does not sleep at the hospital. A clinic worker is one who spends a specified number of hours a week doing outpatient work. He should never be called an extern or an intern. Dentists should remember these differences, as they are particularly important when an effort is being made to get a dental department established in a general hospital.

The hospital authorities are usually cooperative in any definite requests, but some of the responses indicated that, although they were open to the idea, they were not sufficiently impressed with the need of actual dental service. To illustrate: The Waterbury Hospital of Massachusetts writes: "We have no dental intern, but one of our four (medical) interns covers the dental services with the other specialties." How can a medical intern cover the dental specialties? An ophthamologist could more easily cover the gynecologic service.

Table 1 states the source of material included in this paper, with the comparative results of the questionnaires sent and the replies.

Table 2 gives a list of the forty-four hospitals in the United States, and the one from Canada, which have dental interns.[6]

TABLE 1.—SOURCES OF INFORMATION

Letters sent November, 1926, to hospitals in United States having one hundred or more beds, as approved by the *Journal of the American Medical Association*	474	
Additional return a result of one hospital dividing into two sections	1	
Total letters sent November, 1926	475	
Replies received up to January 1, 1928	281	
Percentage of replies received to letters sent		0.591
Letters sent April, 1927, to additional hospitals in the United States, Canada, Mexico, Philippines, Canal Zone and Hawaii	99	
Number of replies received to January 1, 1928	56	
Percentage of replies to letters sent April, 1927		0.565
Total number of letters sent (this includes the hospital divided into two sections)	574	
Total replies received	337	
Total percentage of replies received to letters sent		0.58

5. Franken, S. W. A.: Lenox Hill Hospital Plan for Dental Care of Hospital Patients, J.A.M.A., 83: 1866 (Dec. 6) 1924.

6. Hospitals Approved for Internships, J.A.M.A. (Hospital Number) 88: 840 (March 12) 1927.

TABLE 2—HOSPITALS HAVING DENTAL INTERNS*

Name of Hospital	Location	Number of Beds	No. of Dental Interns	Date of Application	Date of Beginning of Service	Length of Service	Salary or Bonus	Name of Superintendent
CALIFORNIA:								
Alameda County Hospital[1]	San Leandro	326[1]	2	Prior to January 1	July 1	1 year	$75.00 a month	Dr. A. W. Henry
ILLINOIS:								
Presbyterian Hospital	Chicago	425	1	.....	January 1 to July 1	6 months	None	Asa S. Bacon
INDIANA:								
James Whitcomb Riley Hospital for Children	Indianapolis	150	1	March	July 1	1 year	$12.50 a month	Robert E. Neff
Indianapolis City Hospital[3]	Indianapolis	600	1[2]	.....	July 1	1 year	$12.50 a month	Dr. M. A. Doeppers
KENTUCKY:								
Louisville City Hospital	Louisville	400	1	Any time	June 1	1 year	None	J. Ernst Shourse
MASSACHUSETTS:								
Massachusetts Homeopathic Hospital[3]	Boston	559	1[3]	Any time	Indefinite	Indefinite	$110.00 a month	Dr. H. M. Polloh
MICHIGAN:								
University of Michigan Hospital	Ann Arbor	1,100	2	January 2	July 1	3 years	Senior: $50.00 a month Junior: None	Dr. H. A. Haynes
Grace Hospital	Detroit	400	1	Any time	July 1	1 year	$25.00 a month	Dr. W. L. Babcock
Harper Hospital	Detroit	460	2	January to March	July 1	1 year	$100.00 a month	Dr. S. Hamilton
MINNESOTA:								
Minneapolis General Hospital	Minneapolis	689	3	March, April and May	July 1	1 year	None	Dr. W. E. List
Ancker Hospital	St. Paul	850	1	January 1	July 1	1 year	$25.00 a month[4]	Dr. T. G. Carter
MISSOURI:								
St. Louis City Hospital	St. Louis	750	1	.....	.....	.....	None	Dr. E. A. Lehorff
NEBRASKA:								
St. Joseph's Creighton Memorial Hospital*	Omaha	420	1	June	July 1	1 year	$15.00 a month	Venerable Sister M. Cherubina
NEW YORK:								
Greenpoint Hospital	Brooklyn	264	1	.....	September 15	1 year	None	Dr. Adam Eberle
Bellevue Hospital	New York City	1,689	5	Any time	July 1	1 year	None	Dr. M. S. Fleming
Fifth Avenue Hospital	New York City	295	1	.....	July 1	1 year	None	Dr. W. E. Woodbury
Lenox Hill Hospital*	New York City	345	1	March	September 1	1 year	None	G. F. Sauer
Lincoln Hospital	New York City	331	3	June 1	June 30	1 year	None	Dr. J. A. Lanahan
Metropolitan Hospital[5]	Welfare Island, New York City	1,665	1[5]	.....	July 1	1 year	None	Dr. C. B. Bacon
Polyclinic Medical School and Hospital	New York City	350	2	April	July	1 year	None	A. A. Jaller
Presbyterian Hospital	New York City	256	1		July	1 year	None	J. F. Bush
Grasslands Hospital[6]	Valhalla	400	1	Dec. 1	July 1	1 year	$50.00 a month	Dr. Cro. Mauger

Name of Hospital	Location	Number of Beds	No. of Dental Interns	Date of Application	Date of Beginning	Length of Service		Name of Superintendent
OHIO:								
Cincinnati General				Second Saturday				

Name of Hospital	Location	Number of Beds	No. of Dental Interns	Date of Application	Date of Beginning	Length of Service		Name of Superintendent
School and Hospital	New York City	350	2	April	July	1 year	None	A. A. Jaller
Presbyterian Hospital	New York City	256	1		July	1 year	None	J. F. Bush
Grasslands Hospital	Valhalla	400	1	Dec. 1	July 1	1 year	$50.00 a month	Dr. Cro Mauger

Name of Hospital	Location	Number of Beds	No. of Dental Interns	Date of Application	Date of Beginning	Length of Service		Name of Superintendent
OHIO:								
Cincinnati General Hospital*	Cincinnati	850	3	Second Saturday in April	July 1	1 year	None	Dr. A. E. Bachmeyer
City Hospital	Cleveland	1,069	1	December	July 1	1 year	$600.00 a year	L. McNeill
Miami Valley Hospital	Dayton	365	1	January	July 1	1 year	$25.00 a month	Dr. C. R. Crew
Youngstown Hospital Association	Youngstown	275	1	January	July 1	1 year	$100.00 a month	B. W. Stewart
OKLAHOMA:								
State University Hospital	Oklahoma City	275	1	.....	July 1	1 year	$100.00 a month	Paul H. Fesler
PENNSYLVANIA:								
Bryn Mawr Hospital	Bryn Mawr	140	1	.....	July	1 year	$50.00 a month	Miss K. Brown
Episcopal Hospital	Philadelphia	457	1	January 1	July 1	1 year	None	Charles A. Sill
Hahnemann Hospital	Philadelphia	415	1	.....	July 1	1 year	None	John M. Smith
Hospital of University of Pennsylvania	Philadelphia	562	1	April	July 1	1 year	None	Mary V. Stephenson
Jefferson Hospital	Philadelphia	635	1	.....	July 1	1 year	None	Dr. H. K. Kohler
Misericordia Hospital	Philadelphia	271	1	.....	June 1	1 year	None	Mother M. Elmonda
Mt. Sinai Hospital	Philadelphia	155	1	.....	.....	1 year	None	M. Dubin
Pennsylvania Hospital	Philadelphia	308	1	March	July 1	1 year	None	D. D. Test
Philadelphia General Hospital	Philadelphia	2,000	2	.....	July 1	1 year	None	Dr. J. C. Doane
Presbyterian Hospital	Philadelphia	302	2	June	June	1 year	None	C. S. Ritcher
Samaritan Hospital	Philadelphia	266	1	January	July 1	1 year	None	S. W. Meister
St. Francis' Hospital	Pittsburgh	600	1	January	July	1 year	$125.00 a month	S. M. Thomasine
Presbyterian Hospital	Pittsburgh	200	2	.....	.....	.....	None	Miss M. B. Miller
South Side Hospital	Pittsburgh	225	1	.....	July 1		None	Jeanette L. Jones, R.N.
RHODE ISLAND:								
Rhode Island Hospital	Providence	600	1	April	June	1 year	None	Dr. J. M. Peters
TENNESSEE:								
Knoxville General Hospital	Knoxville	225	1	Early spring	July 1	1 year	$50.00 a month	J. H. Mauney
VIRGINIA:								
Medical College of Virginia	Richmond	432	1	.....	July 1	1 year	$25.00 a month	Dr. M. B. Jarmon
CANADA:								
Montreal General Hospital[5]	Montreal	400	1	May	June 1	1 year	None[5]	Arthur L. Walsh

*Except in those hospitals marked with an asterisk (*), in which the position of intern is obtained by examination, internships are by appointment.

1. 388 infirmary beds; interns share work in two other county institutions.
2. Will have after January 1, 1927.
3. A resident appointed.
4. Desire to change to same as medical interns, who work without salary.
5. Has a superintendent of dental department with small salary (amount not stated).

In accordance with the request of the editor that as much information as possible be condensed in this article, we submit various other tabulations. Table 3 gives in detail the alphabetically arranged states with the replies of the hospitals, the number of their beds, the number of dental interns, if any, the number of beds receiving dental service, the number of beds where the United States Army and Navy have dental officers, and the number of beds in these governmental institutions.

Does it not seem negligent that out of 89,967 beds in the replying hospitals, only 23,751 should have some form of dental service? And sixty-two dental interns to take care of these! One dental intern for about 383 beds. This does not mean 383 patients, but 383 beds, where patients have an average stay of less than a fortnight.

And why some of these discrepancies between the various states? Why should Pennsylvania, with replies from forty-two hospitals having 12,237 beds, have seventeen dental interns, giving service to 6,356 beds; whereas, Illinois, with fifteen replying hospitals and 3,196 beds, has only one intern giving dental care to 425 beds. And New Jersey, with twenty-six replying hospitals, with 5,698 beds is without any dental intern. Massachusetts, home of several very good dental colleges, has only one dental intern, serving 559 beds, out of twenty replying institutions with 4,615 beds. It is obvious that the importance of dental treatment is not sufficiently recognized, and it is equally obvious that the onus of blame falls on the dentists. This is proved by the fact that the hospitals having dental interns apparently place dentistry on a high plane and give proper recognition to it, as Table 4 shows.

When the situation throughout the country is analyzed according to states, an amazing result is shown, as is illustrated by Table 5.

In other words, only about one third of the states in the Union have hospitals with a dental intern service. Nor is this the fault of the recent graduates. Last year, at the Lenox Hill Hospital, we had more than twenty applicants for one dental internship. These men were from such diverse localities as Maine, Louisiana and Nebraska. It is therefore evident that the fault lies with the older men, and to give the older and progressive men an opportunity to change this condition, we name, in Table 6, the states not having any dental internship.

It is the part of the dental leaders in these states—in fact in all the states—to insist on hospital recognition. The hospitals will cooperate, but the attending dentist must do more than leave his name in the year-book: he must be willing to devote much time and energy to the building up of a good service. To illustrate the shortcomings of dentists in this capacity, a glance at our replies is sufficient. For example, a Brooklyn (N. Y.) hospital having 175 beds states that they had a dental clinic with two prominent dentists in attendance, but there was no call for their services. The attending dentists are still members of the medical board. When patients must have a tooth extracted, "we call another dentist, who does the work gratis."

Another disheartening situation comes from some of our famous hospitals which pride themselves on their research and advance (but dentistry is the poor orphan). From among several, we select the curt reply from the Johns

TABLE 3.—COMPARISON OF TOTAL NUMBER OF BEDS IN REPLYING HOSPITALS WITH THOSE HAVING DENTAL SERVICE

STATE	Number of Hospitals	Number of Beds	Number of Dental Interns	Number of Beds with Dental Service	Governmental Institutions (Not Included in Totals)
Alabama	2	470	0	0	
California	24	6,918	2	326	Marine & Navy hospitals, 1,220 beds, have dental officers
Colorado	4	595	0	0	Army hospital, 1,428 beds; no interns
Connecticut	8	2,088	0	0	
Delaware	1	200	0	0	
Florida	2	324	0	0	
Georgia	2	355	0	0	
Illinois	15	3,196	1	425	
Indiana	6	1,525	2	750	
Iowa	5	722	0	0	
Kansas	1	215	0	0	
Kentucky	2	510	1	400	
Louisiana	3	650	0	0	Marine Hospital No. 14, 466 beds; 3 dental officers (thinking of putting in dental intern)
Maine	3	455	0	0	
Maryland	8	2,107	0	0	
Massachusetts	20	4,615	1	559	U. S. Naval Hospital, 521 beds
Michigan	14	4,424	5	1,960	
Minnesota	14	4,023	4	1,539	
Mississippi	1	100	0	0	
Missouri	7	2,247	1	750	
Montana	1	117	0	0	
Nebraska	4	241	1	420	
New Jersey	26	5,698	0	0	
New York	54	16,414	16	5,595	U. S. Naval Hospital, Brooklyn, N. Y., 1,000 beds; 3 dental officers
North Carolina	1	135	0	0	
North Dakota	2	340	0	0	
Ohio	19	5,913	6	2,559	
Oklahoma	2	455	1	275	
Oregon	1	400	0	0	
Pennsylvania	42	12,227	17	6,536	U. S. Naval Hospital, League Island, 586 beds
Rhode Island	2	1,282	1	600	
South Carolina	2	250	0	0	
Tennessee	6	1,290	1	225	
Texas	5	1,127	0	0	Station Hospital, U. S. A. Fort Sam Houston, 800 beds
Utah	1	244	0	0	
Vermont	1	150	0	0	
Virginia	4	878	1	432	
Washington	5	940	0	0	
Wisconsin	6	1,291	0	0	
West Virginia	1	200	0	0	
Name or location, or both, not stated	4	1,149	0	0	
Canada	5	2,886	1	400	
Philippines	1	601	0	0	(Has resident, full-time dentist)
TOTALS	337	89,967	62	23,751	

TABLE 4.—STANDING OF ATTENDING DENTIST IN HOSPITALS HAVING DENTAL INTERN SERVICE

NAME OF HOSPITAL	Location	Attending Dentist?	Associate Dentist?	Adjunct Dentist?	Attending Dentist on Same Footing as Other Attendings?	Attending Dentist a Member of Medical Board
CALIFORNIA:						
Alameda County Hospital	San Leandro	Yes	.....	.....	Yes	Yes
ILLINOIS:						
Presbyterian Hospital	Chicago	Yes	.....	.....	Yes	Yes
INDIANA:						
James Whitcomb Riley Hospital for Children	Indianapolis	Yes	.....	.....	Yes	No
Indianapolis City Hospital	Indianapolis	Yes	.....	.....	Yes	No
KENTUCKY:						
Louisville City Hospital	Louisville	Yes	.....	.....	Yes	Yes
MASSACHUSETTS:						
Massachusetts Homeopathic Hospital	Boston	Yes (a)	a	a	Yes	No answer to this question
MICHIGAN:						
University of Michigan Hospital	Ann Arbor	Yes	.....	.....	Yes	Yes
Grace Hospital	Detroit	Yes (b)	b	b	Yes	Yes
Harper Hospital	Detroit	Yes	.....	.....	Yes	No
MINNESOTA:						
Minneapolis General Hospital	Minneapolis	Yes (c)	c	c	Yes	Yes
Ancker Hospital	St. Paul	Yes	.....	.....	Yes	No medical board organized (d)
MISSOURI:						
St. Louis City Hospital	St. Louis	Yes	Yes	Yes	Yes	No medical board
NEBRASKA:						
St. Joseph's Creighton Memorial Hospital	Omaha	Yes	.....	.....	Yes	No
NEW YORK:						
Greenpoint Hospital	Brooklyn	Yes	.....	.....	Yes	Yes
Bellevue Hospital	New York City	Yes	.....	.....	Yes	Yes
Fifth Avenue Hospital	New York City	Yes	.....	.....	Yes	Yes
Lenox Hill Hospital	New York City	No	e	e	Yes	No
Lincoln Hospital	New York City	Director	f	.....	No	No
Metropolitan Hospital	Welfare Island, N. Y. C.	Yes	One assistant attending	.....	Yes	No
Presbyterian Hospital	New York City	Yes	.....	.....	Yes	Yes (director)
Grasslands Hospital	Valhalla	Yes	.....	.....	Yes	No
New York Polyclinic Medical School and Hospital	New York City	Yes	.....	.....	Yes	Yes

NAME OF HOSPITAL	Location	Attending Dentist?	Associate Dentist?	Adjunct Dentist?	Attending Dentist on Same Footing as Other Attendings?	Attending Dentist a Member of Medical Board
OHIO:						
Cincinnati General Hospital	Cincinnati	Yes	Yes	Yes	Yes	Yes
City Hospital	Cleveland	Yes	.....	.....	Yes	No medical board
Miami Valley Hospital	Dayton	Yes	h	h	Yes	Yes
Youngstown Hospital Association	Youngstown	Yes	.....	.....	Yes (i)	Yes
OKLAHOMA:						
State University Hospital	Oklahoma City	Yes	.....	.....	Yes	Yes
PENNSYLVANIA:						
Byrn Mawr Hospital	Bryn Mawr	Yes	.....	.....	Yes	Yes
Episcopal Hospital	Philadelphia	Yes	.....	.....	Yes	Yes
Hahnemann Hospital	Philadelphia	Yes	No	No.	Yes	Yes
Hospital of University of Pennsylvania	Philadelphia	No	k	k	Yes	Yes (medical staff)
Jefferson Hospital	Philadelphia	No	l	l	No	No
Misericordia Hospital	Philadelphia	Yes	.....	.....	Yes	Yes
Mt. Sinai Hospital	Philadelphia	Yes	.....	.....	Auxiliary att. staff	No
Pennsylvania Hospital	Philadelphia	Yes	.....	.....	Yes	Yes
Philadelphia General Hospital	Philadelphia	Yes	.....	.....	Yes	Yes
Presbyterian Hospital	Philadelphia	Yes	.....	.....	Yes	Yes
Samaritan Hospital	Philadelphia	Yes	.....	.....	Yes	No
Presbyterian Hospital	Pittsburgh	Yes	.....	.....	Yes	Yes (medical staff)
St. Francis' Hospital	Pittsburgh	Yes	.....	.....	Yes	Yes
South Side Hospital of Pittsburgh	Pittsburgh	Yes	.....	.....	Yes	Yes
RHODE ISLAND:						
Rhode Island Hospital	Providence	Yes	.....	.....	Yes	Yes
TENNESSEE:						
Knoxville General Hospital	Knoxville	Yes	.....	.....	Yes	No medical board
VIRGINIA:						
Medical College of Virginia	Richmond	Yes	.....	.....	Yes	Member of the staff
CANADA:						
Montreal General Hospital	Montreal	Yes	m	m	Yes	Yes

a. Staff described as oral surgeon, dental surgeon, assistant dental surgeon and resident dentist.
b. Staff described as "consulting and attending, and clinical dentists in outpatient department."
c. Staff described as chief of service, associate and assistants.
d. Visiting dentists are eligible to all positions of staff men.
e. Staff described as "attending dentists and intern."
f. Staff described as "director and twelve assistants."
g. Director used as a consultant in a specialty.
h. Chief of staff and five associates.
i. No voting power.
k. Not modified: there must be at least an attending dentist.
l. One chief dentist, one assistant, one intern.
m. McGill University Demonstrating (Dental) Staff.

Hopkins Hospital, of Baltimore: "We have no dental service in this hospital"—an institution containing more than 700 beds!

Then, the peculiar notions of some other equally famous hospitals: The Peter Bent Brigham Hospital of Boston, Mass., writes: "Two consulting dentists operate our oral surgery cases and extractions. Harvard Dental School is in the next block, and dental cases are referred there." Would they refer a patient suffering from a severe myocarditis and an aching tooth to the next block? Would they treat other specialties in the same manner? The answer is: No—because the attending physicians in other specialties would quickly enough acquaint the authorities with the need for interns.

The work done at the forty-five hospitals having dental interns consists mainly of examinations, prophylaxis, extractions, oral surgery, filling of teeth with cement or amalgam and the treatment of the gingivae. (This is for both adults and children.) Few hospitals do any prosthetic work, with the exception of an occasional splint; and this is as it should be. The surgical department is not called on to create corsets for its patients—why should the dentists make plates? Orthodontia is almost unknown among hospitals, and rightfully so. A dental service in a hospital should be a very busy service, and cannot attempt work that, at best, it takes months or years to complete.

In about two dozen of the replies, the superintendents expressed a desire for further information as to how to start a dental intern service. If the dentists in those cities would only apply themselves, within a year we would have more than sixty hospitals having the service, and the gathering momentum would before long give the United States proper dentistry in hospitals, and one or more dental interns in every institution. Let this be the aim of the national, state and local dental societies!

112 East Seventy-Seventh Street—26 East Thirty-Sixth Street.

TABLE 5.—DENTAL INTERNS ACCORDING TO STATES

Number of states having dental interns	16
Number of states having medical interns, but no dental interns	26
Number of states having neither medical nor dental interns	6

TABLE 6.—LIST OF STATES WITHOUT DENTAL SERVICE

ALABAMA	KANSAS	NORTH DAKOTA
ARKANSAS	LOUISIANA	OREGON
COLORADO	MARYLAND	SOUTH CAROLINA
CONNECTICUT	MAINE	TEXAS
DELAWARE	MISSISSIPPI	UTAH
FLORIDA	MONTANA	VERMONT
GEORGIA	NEW JERSEY	WASHINGTON
IDAHO	NORTH CAROLINA	WISCONSIN
IOWA		WEST VIRGINIA

THE TRAINING OF DENTAL HYGIENISTS AND THEIR RELATIONSHIP TO THE GENERAL MOUTH HYGIENE PROBLEM*

By DOROTHY G. HARD, D.D.S., Ann Arbor, Michigan

IT is always interesting and often surprising to turn back in history and discover that problems which seem new are really very old.

We are inclined to think that mouth hygiene is new because it now forms a definite section at dental conventions and holds a place of prominence in dental literature. The first article to be written on this subject appeared in the first dental periodical in 1844, eighty-three years ago. The author of the paper lamented the fact that too much attention was given to operative procedures, to the exclusion of the "hygiene of the teeth."

It is true that the conception of mouth hygiene in those days was not the one held at present. Then, the dentist had little information at his command by which he might assist the patient in the care of his mouth. The health of the mouth was largely the patient's own affair.

As time went on, various methods of caring for the teeth were advanced, but it was not until 1898 that a definite technic of prophylaxis was demonstrated, by D. D. Smith. Dr. Smith believed that by thoroughly scaling and polishing the teeth, disturbances of the soft tissues and caries could be prevented. His lectures and demonstrations created such an interest that, four years later, C. M. Wright, of Cincinnati, wrote a paper in which he emphasized the importance of Dr. Smith's work and urged that women be trained to do it. A year later, Dr. Rhein, of New York, presented a paper advocating the work of a "dental nurse."

These men realized the value of the prophylactic procedures demonstrated by Dr. Smith, but they admitted that the majority of men in dental practice would not devote the time necessary to carry out such a régime. They acknowledged, too, that women in such a field would be more idealistic and conscientious.

During this time, A. C. Fones, of Bridgeport, became so enthusiastic over the work of Dr. Smith that he trained his office assistant to give prophylactic treatments. Soon, Dr. Fones visualized the benefit which might result if the care which his own patients were receiving were extended to the public school children. He spent four years endeavoring to induce the board of education to appropriate sufficient funds to finance his plan.

When the money was finally secured, the problem then arose as to the training of sufficient workers in this field to carry out the prophylactic treatment of the children. To meet this demand, Dr. Fones, in the fall of 1913, converted his garage into a classroom, where thirty-three young women were trained as the first class of dental hygienists.

To Connecticut goes the honor of having the first dental hygienists and of

*Read before the Section on Mouth Hygiene and Preventive Dentistry at the Sixty-Ninth Annual Session of the American Dental Association, Detroit, Mich., Oct. 26, 1927.

passing the first law, in 1915, defining the field of the hygienist.

The laws which since have been passed by the other states are similar, most of them being patterned after Connecticut's law, which permits the hygienist to "remove deposit and stain from the exposed surfaces of the teeth and directly beneath the free margin of the gum," but adds that she shall not perform any other operation on the teeth or mouth or on any *diseased tissues of the mouth*, and that she may operate in the office of a licensed dentist, in any public or private institution under general supervision of a licensed dentist. An important note is struck in the last part of this Connecticut law: "The state board of dental examiners may revoke the license of any registered dentist who shall permit any dental hygienist operating under his supervision to perform any operation other than that permitted under the provision of this section."

In a review of the literature published since the advent of the hygienist, we discover that there has been considerable adverse criticism of the movement, the chief complaint against it being the fear that the hygienist will sweep into the territory of the dentist and leave him empty-handed and penniless. Such is not the wording of these articles, to be sure, yet, stripped of their illusory phrases, that is their meaning. Putting all other considerations aside for the moment: if statistics are true, the dentists in the large cities could devote their entire time to the children alone and be kept busy for several years to come. The average dentist, after he has been in practice but a few years, has all he can possibly do to keep up with the needs of his own clientele. There have been cavities as long as there have been teeth, and it is not probable that a program of mouth hygiene as carried out by the hygienists would so effectively stop caries that the dental profession would become extinct. Therefore, there seems no basis for such a fear, except selfishness. That argument disposed of, another arises, namely, that the hygienist will not remain within her province in the treatment of the teeth and pericemental tissues. There are two ways of dealing with that problem: First, and perhaps most effective, is the law which confines the hygienist to certain definite procedures and the supervision of the licensed dentist under whom she works. If the supervising dentist fails to carry out his obligations, his license should be revoked. The second is the inculcating of such ideals during her course of training that, for her, digression from the law is impossible.

It has been my observation that, in the majority of cases, the transgressor has been the dentist and not the hygienist. When a dentist places a hygienist who is dependent on her income in the dilemma of treating cases where there are distinctly pathologic conditions, or forfeiting her position, he is guilty of one of three things: he is unwilling for purely monetary reasons to refer such cases to a periodontist; he is equally unwilling to devote sufficient time to treating these cases himself, or he is incapable of diagnosing such cases correctly.

Those dentists who criticize the hygienist training schools because the graduates are not sufficiently familiar with the contour of the roots of the teeth *in situ* or are unskilled in the manipulation of scalers on those surfaces, or complain that the hygienist recognizes but is incapable of treating

Vincent's infection, leave but one conclusion to be drawn: they have lost sight of the original purpose for which the work of the dental hygienist was created.

Hygienists in the schools are confronted with a problem which may necessitate lengthening the course or requiring enough normal school or college credits to place them on an equal footing with the teachers with whom they are associated in the public schools. In some localities, there is a feeling of resentment on the part of teachers toward the hygienist because she enters the school as a part of the teaching staff with only one year of training; whereas, the teacher has spent at least two years before she is authorized to teach. That animosity is not universal. In some schools, the dental hygienist is accepted for what she is worth—a person with a special type of training to do a special type of work.

It is a justifiable premise that, with added years of training in pedagogics, child welfare, public speaking and kindred subjects, the hygienist would be more effective in carrying out a public health program. On the other hand, what would be the outcome of a lengthened course? Probably, the same effect that the lengthened and expensive dental course has had on the number of women taking dentistry. Those of us who undertake it are few and far between. Dentistry appeals even less than medicine to most women.

The question then resolves itself into this issue: Does the public need a greater number of more or less inadequately trained hygienists going into the schools and preaching, and conferring to the best of their ability, the benefits of mouth hygiene, even stirring the children by their white-uniformed presence to give more thought to the care of their own teeth and the teeth of their small brothers and sisters at home, or should there be a smaller number of hygienists with qualifications equal to those of the average public school teacher? Ultimately, the dental hygienist and the dental student problems would parallel in one respect: in a lengthened course, there would be fewer graduates, but these would be more highly specialized. Fewer people, therefore, would receive dental care, but that care would be excellent. Unquestionably, this is right for the dental student. The wide field of his activities and the varied services he must perform require careful and intensive training. For the hygienist, with limitations such as the present laws prescribe, and with the comparative harmlessness of her activities, such lengthy courses of instruction are unnecessary.

After all, with caries admittedly increasing; with the number of dental graduates decreasing; with the overwhelming need for dental attention for the public school children alone, this seems to be the time to put forth an effort to attack this tremendous problem with the means at hand rather than to sit back complacently dreaming of a super-hygienist, provided the one-year hygienist will qualify at all. Obviously, in many localities she is successful, notwithstanding the objections of the school teacher.

Undoubtedly, time will bring changes in the present dental hygienist training courses, just as the curriculum and length of course have changed for the dental students. Various suggestions have been proposed. One is that the hygienist be trained only as a teacher, that her field be educative and not operative; another, that the course be

lengthened and the laws altered to permit hygienists to fill deciduous teeth. It also has been suggested, and seriously too, that the hygienist be trained to treat pyorrhea.

The attitude of the average male dental mind toward treatment of diseased soft tissues of the mouth would be ridiculous if it were not so often actually harmful. He has an amazing inability to discover anything except cavities, but, should he admit the presence of pyorrhea, though he often knows himself incapable of successfully treating it, he is unhesitating in submitting the care of such a case to a hygienist.

Irrespective of the changes that may be made in the hygienist curriculum, the teaching of certain ideals in conduct and practice must always be of paramount importance. If the hygienist acquires a definite perspective of her place in the scheme of things, she will be better fortified to face whatever problems confront her. Of course, it is impossible in a short time to combat heredity, environment and lack of educational background and make a perfect hygienist of each member of the class. Perhaps the best way to inspire the student is to keep constantly before her mind the picture of the ideal hygienist: one who is always immaculately clean, who carries herself with dignity, who has sympathy and patience with those who come for help and advice; a girl to whom dental hygiene appeals because, through it, she can render some benefit to humanity, and not because she as a hygienist can command a larger income than she could by any other short course offered. She realizes that it is within her power to raise the tone of an office or school in which she is employed by performing her duties thoroughly and by impressing those with whom she comes in contact with the importance of her message. She is aware, too, that the continuance of the dental hygienist movement depends on her; on each individual hygienist, not on the dentists or groups of hygienists.

In addition to the imparting of ideals, it is imperative, at this rather critical period, to warn against certain pitfalls. There is an alarming tendency on the part of hygienists employed in offices in large cities to demand fees disproportionate to their training. The girl who spends one year, or even two, receiving her training has no right to demand exorbitant fees, and as surely as this continues, the hygienists will eliminate themselves by putting themselves absolutely outside the financial reach of most dentists and school boards. It is important, too, that the hygienist be taught to obey the law of the state in which she is practicing, for those who oppose the work of the hygienists are avid for cases of disobedience to cite as evidence of failure of the dental hygienist movement.

One would like to state with finality that the hygienist is here to stay, but rumors of dissatisfaction from various parts of the country tend to shake one's assurance. Yet, when we see the tremendous part the hygienists have played and are playing in carrying on public health programs in certain localities, we realize that they are too valuable to be lost.

Therefore, the directors of hygienists training schools, dentists, those interested in promotion of health work and the hygienists themselves should frankly face this problem and together determine what changes are necessary to make the work of dental hygienists entirely acceptable.

MAY DAY—CHILD HEALTH DAY

May Day, sponsored as child health day by the American Child Health Association, offers an opportunity for dentists to cooperate in the work of promoting child health. The following notice has been sent out by the association:

MAKE THE CHILD'S BILL OF RIGHTS
A WORKING PLATFORM IN EVERY COMMUNITY

Better Children for Our Nation; A Better Nation for Our Children

THE CHILD'S BILL OF RIGHTS

The ideal to which we should strive is that there shall be no child in America:
That has not been born under proper conditions
That does not live in hygienic surroundings
That ever suffers from undernourishment
That does not have prompt and efficient medical attention and inspection
That does not receive primary instruction in the elements of hygiene and good health
That has not the complete birthright of a sound mind in a sound body
That has not the encouragement to express in fullest measure the spirit within which is the final endowment of every human being.

—*Herbert Hoover*

To make the vision of this "Bill of Rights" a working program in an increasing number of communities

is

THE PURPOSE OF MAY DAY—NATIONAL CHILD HEALTH DAY

The Child's Bill of Rights is a complete guide to every needed activity to round out the life of the child. Let people everywhere help to incorporate these definite aims into the lives of children:

1. *Preparedness for parenthood: motherhood, fatherhood, prenatal care.*
2. *A wholesome home environment: physical, cultural.*
3. *Sound nutrition.*
4. *Physical examination, correction of defects, protection against disease.*
5. *Training in health habits and knowledge: in the home, in the school.*
6. *Mental and emotional soundness: through inheritance, through environment.*
7. *Spiritual encouragement: through the home, through the church.*

By offering to lecture or to examine the mouths of the school children in your community, by volunteering to help in any way that the personnel of your health agencies may suggest, you will be contributing to the goal of May Day.

FIELD NOTES

Harriet Davis, dental hygienist in Brattleboro, Vt., writes that a recent mouth survey in the seventh and eighth grades showed that 31 per cent of the eight grade and 22 per cent of the seventh grade pupils are regular patients on the dentist's six month call list. Certificates of work completed are furnished to the dentist so that each child, when he has had all his dental work attended to, may receive one to take back to his teacher. His name is then placed on the classroom honor roll.

At a recent public school musicale given in Belleville, Ill., five songs on dental hygiene were placed on the program in recognition of the cooperation and interest of the local dentists in maintaining a clinic for the school children.

Dr. C. B. Webster has been appointed full-time director of dental service with the state board of health in Alabama.

Dr. Herbert E. Phillips, of Chicago, has been appointed the successor to Dr. Harold Smith as dental member of the Child Hygiene Advisory Committee of the Illinois State Department of Health.

NEWSPAPER ARTICLES

On May 1, 1928, a series of fifty-two newspaper articles will be available through the Bureau of Dental Health Education. The first six articles will have a question and answer column, a feature which should be continued throughout the rest of the articles by the group sponsoring the series. The articles may be purchased by any state, district or local society. They will be copyrighted by the American Dental Association; and under no circumstances can they be released with the name of any individual attached thereto. Following is a sample of the articles. For further particulars, write the Bureau of Dental Health Education, American Dental Association, 58 E. Washington St., Chicago, Ill.

THE RETIREMENT AGE*

"I hate to give up this old toothbrush, Jane. It's a wow! I bought it in London a year ago and it has traveled with me through Europe, northern Africa and half of the United States."

Mrs. Williams surveyed her husband as he spit out a few detached bristles and deposited his cosmopolitan toothbrush in its rack over the green marble wash basin. "You were in London in May, weren't you dear?" she inquired mildly. "Where were you in July?"

"In Switzerland. Spent the Fourth of July in Montreux. Jones and I had a room overlooking Lake Geneva. We could drop a cigar stub out of our window and hear it strike the water. The prisoner of Chillon had nothing on us."

"That would have been an ideal place to drop the toothbrush," Jane interrupted. "What a romantic and timely end for your favorite brush!"

And then Jane Williams had her first real conversational innings since her husband returned from an international convention two weeks before. While the head of the household was seeing sights, Jane had been learning facts in a university extension course in hygiene.

"Two months is the normal life span of any hygienic toothbrush, Jerry. Every person needs two brushes at a time; then he never need use one when the bristles are damp and soft. Dark bathrooms like ours are good germ breeders. I've been sunning my brushes every day lately and you can't imagine how much sweeter they smell.

"We were studying about an investigation of toothbrushes made by the department of public health at Yale, and you'd be horrified at what was found. In several cases, whole families used the same toothbrush. Of course, we were never that ignorant. But we do rinse our brushes in cold water, and we never used to let the sunlight get near them."

"Why all these expressions of pity over toothbrushes, Jane? Are humane societies now being organized for the protection of weak and helpless toothbrushes?" asked Jerry.

"Don't try to be facetious, Jerry. It's not your best line. The point is that societies need to be formed for the protection of weak and ignorant persons like you and me, who month in and month out use toothbrushes that are a menace to health because they have not been given proper care and early retirement from active service.

"One toothbrush investigated by the Yale department yielded almost two and one-half million bacteria. It was 14 months old, just a little older than your prize London brush.

"Almost all the toothbrushes examined showed high bacterial counts. Some of the reasons for this were: long use of the same brush, dirty and decayed teeth, failure to use a dentifrice (a simple home one such as salt and water will do), failure to rinse the brush in hot water, and—oh, well, I can't remember all the things they found."

"Jane, not in all Europe, northern Africa or half of the United States have I encountered a more eloquent plea for the voluntary retirement of aging toothbrushes. I hereby present you with one purchased in the city of London, and I only regret that I cannot supply you with Lake Geneva as a romantic spot for its interment."

*Toothfully Speaking Series.

Medical and Dental News

Florida

Central Florida Dental Society Meets: At the meeting of the Central Florida Dental Society held in Gainsville, February 3-4, the following program was presented: "Periodontia and Oral Focal Infection," by Thomas B. Hartzell, Minneapolis, Minn.; "Fractures of the Mandible and Maxilla," by C. B. Coleman, Ocala; "Nitrous Oxid and Oxygen Anesthesia," by E. L. Thompson, Daytona Beach; "Something New in Clasps," by George M. Budlong, Clermont. The society covers the territory extending from coast to gulf and from Orlando to Gainsville.

Kentucky

Southeastern Dentists Meet: The regular quarterly meeting of the Southeastern Kentucky Dental Society was held in Pineville, February 4. The essayists of the evening were J. G. Foley, of Pineville, and Theodore von Beust, of Louisville. Officers for the ensuing year are: president, J. G. Foley, Pineville; vice president, Charles Mouser, Evarts; secretary-treasurer, J. M. Brooks, Pineville.

Massachusetts

Harvard Scholarships Awarded: The Harvard Dental School has awarded fourteen scholarships to students of the school, under five scholarship funds, to be held during the current academic year. The list follows:

Alford scholarships—J. Victor Miller, '28; Robert S. Wesson, '28; Charles M. Copeland, '28.

Peter E. Strauss scholarships—Leon F. Densmore, '29; Justino Franco, Jr., '28; Samuel Gornne, '28; Horace Irenee Marcotte, '28; Harold I. Walcott, '28.

Eugene Hanes Smith scholarships—Milton L. Boyle, '28; Joseph P. Jazowski, '29.

Dwight M. Clapp scholarship—George E. Thompson, '29.

Joseph Eveleth scholarships—Donald D. Osborn, '29; Costas D. Verros, '28; William Wenzell, '30.

Dental Surgeon for Lynn Schools: A modern dental clinic has been fitted up in the new administration building of the Lynn school department and civil service examinations for the position of dental surgeon to have charge of the clinic were held March 10. The salary is $500 a year. The surgeon attends the clinic twice a week, from 9 to 11 a. m.

Michigan

School Dental Clinic: During the month of February, school dental clinics were held throughout the schools of Milan. Every child was examined by a member of the examining board, who then acted in an advisory capacity to the parents regarding the dental work needed.

Ohio

Central State Society Elects Officers: At the annual meeting of the Central Ohio Dental Association in Marion, the following officers were elected for the coming year: president, J. H. Bristol, Mansfield; vice president, H. J. Nickel, Marysville; secretary, D. M. Leithner, Mansfield.

Texas

Midwinter Clinic: The third annual midwinter dental clinic sponsored by the Dallas County Dental Society was held in Dallas, February 6-8, with about 250 dentists in attendance from throughout the state and from adjoining states. The chief essayists of the occasion were Edward T. Tinker, Minneapolis, Minn., who spoke on operative dentistry; Bernard G. DeVries, also of Minneapolis, whose subject was orthodontia; James A. Blue, of Birmingham, Ala., whose specialty is oral surgery, and Russell W. Tench, of New York City, whose subject was prosthetic dentistry.

General

Offer of Large Prize for Cancer Cure Extended: The managing director of the American Society for the Control of Cancer, George A. Soper, Ph.D., announced, February 2, that the offer of $100,000 for the discovery of methods for the prevention and cure of cancer by William Lawrence Saunders which expired will be extended until Feb. 1, 1929, or longer, following the suggestion of Mr. Saunders. The 3,158 applications received and those still coming in will be submitted to a reference board of five authorities on cancer who will study them for possible leads to new methods of attack on cancer. Many of the letters were from persons who had no scientific training, and none of the applications have revealed any process that warrants giving up the methods of treatment now recognized by the medical profession. Dr. Soper pointed out that the society will not only investigate new methods suggested but will also inform the public of the worthlessness of some popular remedies.—*J.A.M.A.*, Feb. 25, 1928.

Dutch Dental Clinic: The stomatologic association of Amsterdam has opened a cooperative clinic, the purpose of which is to support a publicity campaign in favor of dental hygiene among those who cannot afford private dental treatment. The fees charged in this cooperative clinic will be determined by the overhead expense.—Netherlands letter, *J.A.M.A.*, Feb. 25, 1928.

Foreign

Nomenclature of Teeth: The British Society for the Study of Orthodontics appointed a committee to consider the present systems of nomenclature. The report would sanction a large number of terms, with alternatives in a few cases. The term "cervix" of a tooth is adopted, with "neck" as an alternative; but the terms "fang" and "prong" are rejected for "root" and "apex." The committee has difficulty in defining the orthodontic term "vault." The definition ultimately adopted was "the longest palatal border obtainable through a coronal section of a maxilla," and the term "transpalatine arch" was rejected. Much trouble was taken over the definition of "occlusion." Ideal occlusion was defined as a hypothetic standard of occlusion based on the morphology of the teeth, and normal occlusion as that occlusion which was within the standard deviations. "Inclination," defined as "the rotation of the tooth around any transverse axis," was preferred to the continental term "version." In regard to treatment, a good "anchorage" was defined as the point of attachment at which the force of reaction produces little or no movement. Mr. George Northcroft, a member of the committee, who had had the opportunity of discussing nomenclature with American orthodontists at the recent conference in New York, had difficulty in persuading the Americans that there was no such thing as reciprocal anchorage. He pointed out that if the U. S. ship *Minnesota* was anchored to the earth, the earth might stabilize the *Minnesota*, but the *Minnesota* would not stabilize the earth. The Americans, however, remained unconvinced and in respect to appliances and treatment the British and American nomenclatures have to differ. One American orthodontist objected to the term "cheek teeth" (all teeth posterior to the canines), but Mr. Northcroft pointed out to him that it was a term used by the American anthropologist W. K. Gregory and had come into general use. The alternative term, "teeth of molar series," is, however, to be permitted, but not the term "back teeth." To his surprise the Americans accepted the term "premolar" although in former discussions they had insisted on the term "bicuspid," but with regard to occlusion they rejected the British term "normal," "prenormal" and "postnormal," favoring instead "neutrocclusion," "distocclusion," and "mesiocclusion." They abandoned "gression" and "trusion" in favor of "displacement" as meaning malposition of the crown and root of an individual tooth to an equal degree and in the same direction.—London Letter, *J.A.M.A.*, May 14, 1927.

Army

Dental Corps: Capt. L. W. Maly relieved Camp Stephen D. Little, assigned Fort Crook, effective August 1.

Capt. H. L. Hogan, Fitzsimons General Hospital, ordered before Army retiring board, Denver.

Maj. H. S. Rush relieved Creighton University, assigned Fort Eustis, effective June 10.

Capt. B. L. Smith granted 2 months' leave upon arrival in United States.

Capt. J. C. Burr, assigned Fort Oglethorpe upon completion of foreign service.

1st Lieut. M. E. Kennebeck, granted leave of one month and twenty days, effective August 15.

1st Lieuts. W. E. Chase, Fort Sam Houston, and K. P. Fulton, Fitzsimons General Hospital, have been appointed first lieutenants.

1st Lieut. H. D. Phillips, relieved Walter Reed General Hospital; assigned Hawaii.

Capt. D. S. Gray, relieved Fort Wayne; assigned Selfridge Field.

Lieut. Col. G. D. Graham, now at Letterman General Hospital, detailed to O. R., 9th C. A., and with 91st Div., in addition to other duties.

Major R. W. Pearson relieved Walter Reed General Hospital, assigned Philippines, sailing from New York October 7.

Capt. H. L. Hogan granted 2 months and 3 days' leave.—*Army and Navy Register.*

DEATHS

Bell, Robert, Spokane, Wash.; Chicago College of Dental Surgery, Dental Department of Loyola University, 1903; died, December 22.

Brumbaugh, Lawrence M., Eaton, Ohio; died, February 9, aged 60; Dr. Brumbaugh returned to his old home in Eaton two years ago, from Salt Lake City, Utah, where he had been in practice since 1902.

Fowler, H. B., Sheboygan, Wis.; Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania, 1894; died, February 18. Dr. Fowler had practiced in Sheboygan for thirty-four years.

Gale, William M., Gainsville, Texas; St. Louis University College of Dentistry, 1925; died, January 28, from pneumonia, aged 25.

Gismore, L. L., Philadelphia, Pa.; died, February 14.

Hinds, F. W., Ashland, Kan.; Northwestern University Dental School, 1904; died, January 27, from injuries received in a motor accident; aged 48.

Hughes, L. P., Houlton, Maine; Temple University School of Dentistry, 1900; died, January 25; aged 53. Ill health forced Dr. Hughes to give up his practice eight years ago. In an effort to regain his health, he had spent the intervening years in traveling in the south and west.

Leonard, R. G., Brooklyn, N. Y.; University of Buffalo School of Dentistry, 1903; died, February 5, after a long illness.

Marks, David G., Chicago, Ill.; Northwestern University Dental School, 1903; died, January 11.

McCutcheon, William H., Brooklyn, N. Y.; New York College of Dentistry, 1894; died, January 26; aged 57.

McIlwain, C. E., Louisville, Ky.; Washington University Dental School, 1894; died, February 2; aged 58.

Mills, James J., Port Jervis, N. Y.; died suddenly, February 2; aged 76. Dr. Mills had been in practice for fifty years.

Mitchell, William H., Bayonne, N. J.; New York College of Dentistry, 1882; died, January 25; aged 68.

Monroe, Charles W., Parkersburg, W. Va.; Ohio College of Dental Surgery, Dental Department of the University of Cincinnati, 1901; died, June 15, after an illness of six years, attributed to his being gassed four times while doing Y. M. C. A. work with the A. E. F. in France. Dr. Monroe was 50 years old.

Munger, Edwin H., Hartford, Conn.; Temple University School of Dentistry, 1892; died of pleural pneumonia, February 2.

Payson, William S., Castine, Maine; Temple University School of Dentistry, 1886; died, February 8; aged 69.

Pisha, Beatrice M., Chicago, Ill.; Chicago College of Dental Surgery, Dental Department of Loyola University, 1917; died recently.

Rippier, Edwin T., Brooklyn, N. Y.; died, June 7; aged 76. Dr. Rippier was born in England. He had practiced dentistry in Brooklyn for fifty years.

Royce, Edward A., Evanston, Ill.; Temple University School of Dentistry, 1878; died, February 17; aged 75.

Schaenen, Saul, Brooklyn, N. Y.; New York College of Dentistry, 1915; fell from the roof of a seven-story building, where he had gone to repair an aerial. Dr. Schaenen was 33 years old. He is survived by his wife and a 2-year-old son.

Seale, D. W., Lake Village, Ark.; University of Louisville School of Dentistry, 1902; died, February 13, after a long illness; aged 52.

Announcements

CALENDAR OF MEETINGS*

NATIONAL SOCIETIES

American Dental Assistants Association, August 21-23, 1928, Minneapolis, Minn.

American Dental Association, August 20-24, 1928, Minneapolis, Minn.

American Dental Hygienists Association, August 20-23, 1928, Minneapolis, Minn.

American Dental Society of Europe, July 30-August 1, 1928, Brussels, Belgium.

American Society of Oral Surgeons and Exodontists, August 17-18, 1928, Minneapolis, Minn.

American Society of Orthodontists, April 30-May 1-3, 1928, Buffalo, N. Y.

STATE SOCIETIES

District of Columbia, at George Washington University, Washington, D. C., second and fourth Tuesdays in each month from October to June inclusive.

April (1928)

Alabama, at Birmingham (10-12).
California, at Stockton (9-12).
Connecticut, at New Haven (11-13).
Kentucky, at Louisville (3-5).
Maryland, at Baltimore (April 30-May 2).
Michigan, at Detroit (17-19).
New Jersey, at Asbury Park (18-21).
North Carolina, at Charlotte (16-18).
Oklahoma, at Tulsa.

May (1928)

Arkansas, at Little Rock (21-23).
Illinois, at Rock Island (8-10).
Indiana, at Indianapolis (21-23).
Iowa, at Des Moines (1-3).
Kansas, at Topeka (7-9).
Massachusetts, at Boston (7-11).
Missouri, at Kansas City (14-17).
Nebraska, at Lincoln (21-24).
New York, at Syracuse (16-18).
North Dakota, at Minot (8-10).
Pennsylvania, at Altoona (15-17).
South Carolina, at Myrtle Beach (21-23).
South Dakota, at Aberdeen (15-17).
Tennessee, at Nashville (8-11).
Vermont, at Burlington (23-25).
Virginia, at Roanoke (29-31).
West Virginia, at Parkersburg (14-16).

June (1928)

Georgia, at Atlanta (13-15).
Idaho, at Boise (11-13).
New Hampshire, at North Conway (13-15).
Southern California, at Long Beach (7-9).
Texas, at El Paso (5-7).
Washington, at Tacoma (25-27).

July (1928)

Wyoming, at Casper (9-10).

December (1928)

Ohio, at Toledo (4-6).

*Announcements must be received by the ninth of the month in order to be published in the forthcoming issue of THE JOURNAL.

MEETINGS OF STATE BOARDS OF DENTAL EXAMINERS

Arkansas, at Little Rock, June 18-23, 1928. Secretary, C. L. Hunt, 402 First National Bank Building, Ft. Smith, Arkansas.

Illinois, at Chicago, June 12-16, 1928. Superintendent of Registration, V. C. Michels.

Indiana, at Indianapolis, June 18, 1928. Secretary, J. M. Hale, Mt. Vernon, Indiana.

Kentucky, at Louisville, June 8-12, 1928. Secretary, Robert L. Sprau, 968 Baxter Avenue, Louisville, Kentucky.

Minnesota, June 11-16, 1928. Secretary, F. E. Cobb, 601 Donaldson Building, Minneapolis, Minnesota.

New Jersey, at Trenton, June 25-30, 1928. Secretary, John C. Forsyth, 148 W. State Street, Trenton, New Jersey.

Oklahoma, at Oklahoma City, June 25-28, 1928. Secretary-Treasurer, Charles A. Hess, Idabel, Oklahoma.

Pennsylvania, at Philadelphia and Pittsburgh, June 20-23, 1928. Alexander H. Reynolds, 4630 Chester Avenue, Philadelphia, Pennsylvania.

IDAHO STATE DENTAL ASSOCIATION

The Idaho State Dental Association will meet in Boise, June 11-13, after the Utah State Dental Association meeting at Salt Lake City, June 6-8, and preceding the Oregon meeting, June 18-20, and the Washington meeting, the last week in June.

H. B. COLVER, *Secretary*,
Boise, Idaho.

THE NEW JERSEY STATE DENTAL SOCIETY

The fifty-eighth annual meeting of the New Jersey State Dental Society will be held in the Berkeley-Carteret Hotel, Asbury Park, N. J., April 18-21. Essays will be presented Wednesday and Thursday; clinics, Wednesday, Thursday and Friday. The essayists are Sherman L. Davis, Indiana School of Dentistry, who will speak on "Relation of Nutrition to Body Structures;" Edward H. Hatton, Northwestern University Dental School, whose subject is "Bacterial and Histologic Findings After Present-Day Root Canal Treatment;" Justin D. Towner, University of Tennessee, College of Dentistry, who will speak on "Periodontal Pathology the General Practitioner Should Detect and Treat;" and Weston A. Price, Cleveland, Ohio, whose subject is "New Fundamentals for the Prevention of Dental Disease, with Special Consideration of Calcification and Decalcification Processes." There will also be clinics. All members in good standing in the American Dental Association are cordially invited to attend. Membership card must be shown to prove eligibility for admission to essays and clinics.

A. E. BOICE, *Chairman*,
Publicity Committee.

THE DENTAL SOCIETY OF THE STATE OF NEW YORK PRELIMINARY PROGRAM

The sixtieth annual meeting of the Dental Society of the State of New York will be held at the Hotel Syracuse, Syracuse, May 16-18. Literary exercises, clinics, exhibits, etc., will be held at the Hotel Syracuse. Daniel Jutton, 405 E. Fayette St., Syracuse, is chairman of the Exhibits Committee. I. J. Silverman, 541 E. Genessee St., Syracuse, is chairman of the Clinic Committee. The Executive Council will convene for the transaction of the business of the society, Tuesday, May 15, at 3 p. m. The essayists are: Edward C. Kirk, Philadelphia, Pa., Chalmers J. Lyons, Ann Arbor, Mich., William E. Harper, Chicago, Ill., R. H. Volland, Iowa City, Iowa, M. M. House, Whittier, Calif., and Edward Kennedy, New York City. During the time of the meeting, the New York State Dental Hygienists Association and the Dental Assistants Association will meet. Headquarters will be at the Hotel Syracuse and reservations should be made direct with the hotel management. For further information, apply to

A. P. BURKHART, *Secretary*,
57 East Genessee St.,
Auburn, N. Y.

ARKANSAS STATE BOARD OF DENTAL EXAMINERS

The Arkansas State Board of Dental Examiners will hold their next annual meeting at Little Rock, June 18-23, 1928.

C. L. HUNT, *Secretary*,
402 1st Nat'l. Bank Bldg.,
Ft. Smith, Ark.

ILLINOIS STATE BOARD OF DENTAL EXAMINERS

The next examination for license to practice dentistry in Illinois will be held, June 12-16, at Chicago. For applications (which must be filed at least ten days before the examination) and other information, address the Department of Registration and Education, Springfield.

V. C. MICHELS,
Superintendent of Registration.

MINNESOTA STATE BOARD OF DENTAL EXAMINERS

The Minnesota State Board of Dental Examiners will hold their next meeting at the College of Dentistry, University of Minnesota, June 11-16. Applications for examination must be in the hands of the secretary by June 1.

F. E. COBB, *Secretary*,
601 Donaldson Bldg.,
Minneapolis, Minn.

OKLAHOMA STATE BOARD OF DENTAL EXAMINERS

The Oklahoma State Board of Dental Examiners will hold their next meeting for the purpose of examining applicants, June 25-28, inclusive, at the State Capitol Building, Oklahoma City. Applications must be in the hands of the secretary one week before the examination. For applications, statement of requirements, etc., address

CHARLES A. HESS, *Sec'y-Treas.*,
Idabel, Okla.

PENNSYLVANIA STATE DENTAL COUNCIL AND EXAMINING BOARD

The Pennsylvania State Dental Council and Examining Board will hold its regular examinations, Wednesday-Saturday, June 20-23, in Philadelphia and Pittsburgh. The theoretical examinations will be held in the old Musical Fund Hall, 808 Locust St., Philadelphia, and the University of Pittsburgh, Pittsburgh. The practical examinations will be held on Wednesday, June 20, at 8:30 a. m., at the Evans Institute, Philadelphia, and the University of Pittsburgh, Pittsburgh. Examinations will be held in the fundamental subjects of the course for students who have completed two years in a dental school, Thursday and Friday, June 21-22. Examinations will be held for hygienists, June 20-22. The examinations will be held at the same places in Pittsburgh, while in Philadelphia the theoretical examination will be held in City Hall. The practical examination will be held, Wednesday, June 20. Application papers may be secured from the Department of Public Instruction, Harrisburg. For further information, address

ALEXANDER H. REYNOLDS,
4630 Chester Ave.,
Philadelphia, Pa.

EXAMINATION FOR APPOINTMENT TO DENTAL CORPS OF U. S. NAVY

A competitive examination for appointment to the Dental Corps of the United States Navy will begin, May 21, at the U. S. Naval Medical School, Washington, D. C. Candidates must be citizens of the United States, between 21 and 32 years of age at the time of appointment, and graduates of recognized dental schools. The examination will be both theoretical and clinical and the usual duration is about seven days. Application forms and a circular of information may be obtained from the Chief of the Bureau of Medicine and Surgery, Navy Department, Washington, D. C. No allowance is made for the expense of applicants appearing for examination.

E. R. STITT, *Surgeon-General*,
U. S. Navy.

THE AMERICAN DENTAL SOCIETY OF EUROPE

The forty-seventh annual meeting of the American Dental Society of Europe will be held, July 30-August 1, at the Palace Hotel, Brussels, Belgium.

J. A. HOLDEN, *Secretary*,
40, Park Lane,
London, W.1.

CONNECTICUT DENTAL HYGIENISTS ASSOCIATION

The next annual meeting of the Connecticut Dental Hygienists' Association will be held at Troup Junior High School in New Haven, April 12. This will be in conjunction with the Connecticut State Dental Association meeting. All hygienists from Connecticut and from other states are cordially invited to attend.

AGNES G. MORRIS, *Secretary*,
886 Main St.,
Bridgeport, Conn.

A TESTIMONIAL TO DEAN THORNTON PLANNED BY HIS FRIENDS

The many friends of Dean Thornton will learn with sincere regret that his health has been gradually failing for some time and that his condition is such as to demand a complete rest and retirement from active work.

Doctor Thornton has given many years of valuable service to his chosen profession and it is proposed that his retirement be marked by a suitable testimonial from his numerous friends as an expression of their affection and the appreciation of the profession for the valuable contributions Dean Thornton has made to the status and progress of dentistry.

It has been decided by a committee of his personal friends that the testimonial shall take the form of a purse of gold and that every dentist have the privilege of sharing in this token of good-will toward one of their number who has been permanently incapacitated by illness. Those desiring to avail themselves of this opportunity may do so by forwarding name and amount to *Dr. A. L. Walsh, McGill University, Montreal, before the 20th of April.

*Please make checks payable to McGill University, Thornton Presentation Fund.

Dr. Thornton graduated in dentistry from the University of Toronto in 1890 and practiced for a number of years in Chatham, Ontario. In 1902, he was appointed professor of crown and bridge prosthesis in the School of Dentistry of the Royal College of Dental Surgeons of Ontario, where he served until 1913, when he was appointed dean of the Faculty of Dentistry at McGill.

Dean Thornton was greatly appreciated as an after-dinner speaker both in Canada and the United States, and some years ago was honored in being elected president of the American Dental Teachers' Association.

THE THORNTON TESTIMONIAL COMMITTEE

The Thornton Testimonial Committee is composed of Drs. F. G. Henry (chairman), A. W. McClelland, F. H. A. Baxter, J. S. Dohan, D. P. Mowry, Wallace Seccombe and A. L. Walsh, honorary secretary-treasurer. A special names committee has been appointed with Dr. Dohan as chairman.

AMERICAN DENTAL ASSOCIATION

Minneapolis, Minnesota. August 20 to 24, 1928.

HOTEL RESERVATION

The Housing Committee for the American Dental Association meeting in Minneapolis has compiled a roster of hotels approved by the Minneapolis Civic and Commerce Association and the Hotel Association.

Please be accurate in filling out the reservation form below and send it to the hotel of your first choice. You will be advised by the hotel of the receipt and listing of your reservation.

In the event that the reservation of your first choice cannot be made, the hotel manager will forward this blank to the Chairman of the Halls and Hotels Committee. He will place your reservation under either your second or third choice; or, if these are not available, in as favorable a hotel as possible. You will be advised of the name and location of the hotel in which the reservation is made and the hour at which the reservation begins. Rooms not occupied at the designated hour of the reservation may be reassigned by the hotel.

Please remember that a reservation constitutes a contract with the hotel to provide you with the accommodations that you desire. If you find it impossible to carry out your part of the contract, namely, to occupy the room at the time agreed on, please write or wire the hotel releasing it, in order that your room may be made available for other members.

MAIL THIS APPLICATION DIRECT TO HOTEL

HOTEL RESERVATION

AMERICAN DENTAL ASSOCIATION, MINNEAPOLIS, MINN., AUG. 20 TO 24, 1928

.....Hotel.

Minneapolis, Minn.

Dear Sir: Please make reservations noted below:

.....rooms with bath for.....persons. Rate: $..... to $..... per day per room

.....rooms without bath for.....persons. Rate: $..... to $..... per day per room

Date of arrival.....Hour.....

Date of leaving.....

Please note the following second and third choice of hotels:

Second choice .....

Third choice .....

Room or rooms will be occupied by

NAME	ADDRESS IN FULL
.....	.....
.....	.....

Name of applicant.....

Street and number..... City and state.....

Please confirm this reservation to applicant. I further agree to notify the hotel immediately in event I am unable to use this reservation.

Important to hotel manager:—In event that you cannot accept this reservation, please forward this application at once to Dr. W. C. Naegeli, Chairman Halls and Hotels Committee, American Dental Association, 301 Donaldson Bldg., Minneapolis, Minn., who will attend to the assignment of this reservation.

HOTEL and ADDRESS	Rooms	WITH BATH		WITHOUT BATH	
		One Person	Two Persons	One Person	Two Persons
RADISSON 7th St. between Hennepin & Nicollet	500	$3.00-6.50	$5.00-30.00	$2.00-2.75	$4.00
NICOLLET Washington at Nicollet	600	2.50-6.00	4.00-8.00	2.00	3.50
CURTIS 10th St. & 4th Ave. S.	825	2.00-3.00	3.00-6.00		
LEAMINGTON 3rd Ave. S. at 10th St.	500	2.50-4.50	3.50-6.00		
SHERIDAN 1112 Marquette	450	2.50 up	3.50 up	1.50 up	2.50 up
ANDREWS Hennepin & 8th St.	328	2.50-6.00	4.00-7.00	2.00-2.50	3.00-3.50
BUCKINGHAM LaSalle & 15th St.	138	2.50-3.50	4.00-6.00		
CAMFIELD Marquette & 8th St.	100	1.50-1.75	2.50	1.25	2.00
DYCKMAN 6th St. between Hennepin & Nicollet	300	2.00-5.00	4.00-7.00		
FRANCIS DRAKE 10th St. & 5th Ave. S.	160	2.50-5.00	3.50-6.00		
ELGIN Hennepin & 8th St.	125	1.50	3.00 up	1.00	2.00 up
HASTINGS 12th St. & Hawthorne	150	1.75-4.00	2.50-5.00		
MARYLAND LaSalle & Grant	172	2.00-2.50	3.00-3.50		
PLAZA Kenwood Parkway & Hennepin	160	2.50-6.00	3.50-6.00		
PAULY Nicollet & High	48			1.00-1.50	1.50-2.00
ROGERS Nicollet & 4th St.	200	2.00-2.50	3.50-5.00	1.25-1.50	2.50
RUSSELL 16 S. 4th St.	125	1.50-2.50	2.50-4.00	1.25-1.50	2.00-3.00
SENATOR 314 S. 8th St.	80	2.00 up	3.00 up		
ST. REGIS Marquette & 9th St.	58	1.50-3.00	2.50-4.00		
VENDOME 4th St. between Hennepin & Nicollet	250	1.75	3.00-3.50	1.25-1.50	2.00-2.50
WEST Hennepin & 5th St.	362	2.00-4.00	3.00-5.00	1.50-2.00	2.50-3.00

QUESTIONS AND ANSWERS
REGARDING THE
Library Bureau,
FORMERLY THE DEPARTMENT OF LITERARY RESEARCH

1. Do you have a complete list of the books in the library that are available for circulation?
   Not at present. In the December, 1927, issue of THE JOURNAL is a list of the books published during 1925, 1926 and 1927 which are in the library.
2. Why can't I buy a package library?
   In the first place, it would be expensive. Many packages represent twenty or more different magazines, and, in the second place, it might not be possible to replace the material necessary to duplicate the package.
3. Why is there a charge for borrowing package libraries and only a deposit required for borrowing books?
   It is expensive to give the package library service because of the time involved in assembling the packages. The charge of fifty cents covers only a small part of the cost of compiling an original package.
4. When a package library is listed as available for circulation, why can't I get it immediately?
   Every time a package is listed as available, ten or fifteen requests for it are received. It can be sent to but one place at a time, and it is impossible to make fifteen duplicate packages.
5. How many different journals do you receive for clipping purposes?
   Publishers of twenty-one journals regularly send in copies for clipping. Odd copies of many others have been given the library occasionally.
6. Do you want gifts of books?
   Yes: the more there are in the library, the more there will be available for circulation.
7. Will you continue to loan books and package libraries to me after I move to Arizona?
   Yes. Members of the Association are entitled to service no matter where they may be located.
8. May I look up the material and write my paper in your library?
   You are most welcome to do so.
9. Don't you have any material for sale?
   Bibliographies are sold by the Library Bureau, but at present there is not sufficient help in the library to do much work along this line. The Bureau of Dental Health Education sells reprints, posters, etc., on subjects within the scope of their service.
10. Is it possible for you to send us certain numbers of THE JOURNAL to complete the files in our library?
    Send in your list of missing numbers, and such of them as are available will be sent you.
11. Why don't you make more bibliographies on various subjects?
    Bibliographies require a great deal of time even with the aid of an index. When the Dental Index is completed, it will be an invaluable help, but even then additional assistance will be necessary in the library before this kind of work can be undertaken on a comprehensive scale.
12. Do you need back numbers of the magazines? I notice that you already have all that I can offer.
    We never have had too many copies of journals. Many times, there is need for ten or fifteen copies of a single number in the compilation of duplicate packages.
13. When will there be another list of the new books that are available from your library?
    As soon as a sufficient number of new books are added to make another list worth while; probably in the May or June issue of THE JOURNAL.

14. Why do you sometimes send the package libraries by first class mail?
When typewritten material is sent by mail, it is supposed to go first class. The packages which contain typed material should go this way. Because of the parcel post zones, packages going a long way can go almost as cheaply first class and they are not nearly so likely to be bent and torn.
15. Am I expected to pay postage both ways?
At present, the Association pays the postage one way. This may have to be changed if the expense is found to be too great.
16. How long may I keep the books and package libraries?
Two weeks from the time the material leaves this office is the time ordinarily allowed. If there are no others waiting for the same book or package, an extension of time will be given if requested.
17. If the package is lost, what should I do? I can't seem to locate it at present.
An extension of time on the package has been given in the hope that it will be found. As the name of the Association is on it, this is not unlikely. If the package is not recovered, a bill will be sent you for the material, or, if you prefer, a list of the articles, in order that you may replace them.
18. How many books may I borrow at one time?
As the number of books available is limited, we prefer to loan only one or two at a time, unless a special subject is being studied and several are needed at once for purposes of comparison.
19. Why don't more libraries have this kind of service? It is so convenient and saves so much time.
You can easily understand that it is an expensive service as the librarian's time instead of the borrower's is consumed in looking up the material. This kind of service is being given by several large medical libraries with the aid of grants from philanthropic foundations.
20. When I need a package that hasn't previously been compiled, how long a time must I allow before expecting it?
It is hard to say. As requests are taken care of as nearly as possible in the order in which they are received, it all depends on the number of people already waiting. If material is needed for a definite date, it is well to so state. An effort will then be made to get it to you at that time. Generally speaking, the more time allowed, the better, as it may be possible to collect more articles.
21. Do you send material on any requested subject?
Yes, we try to cover any subject pertaining to dentistry.
22. Will you write a paper for me? I have been asked to give one before our local society.
It is not within the scope of our service to write papers. Articles which may offer suggestions can be sent you.
23. How long has this service been given?
The original announcement regarding the inauguration of the Department of Literary Research was published in the April, 1927, issue of THE JOURNAL. On December 11, 1927, the name was changed by the Ad Interim Committee of the Board of Trustees to Library Bureau.

AMERICAN SOCIETY OF ORAL SURGEONS AND EXODONTISTS

The tenth annual meeting of the American Society of Oral Surgeons and Exodontists will be held at the Radisson Hotel, Minneapolis, Minn., August 17-18.

HARRY BEAR, *Secretary*,
410 Professional Bldg.,
Richmond, Va.

ANNOUNCEMENT OF SUMMER SCHOOL FOR DENTAL HYGIENISTS

The six weeks' postgraduate summer course for dental hygienists given at the University of Buffalo for the past two years has been transferred to the Buffalo State Teachers College.

The subjects to be given in the course are

such as have been found requisite and desirable in preparing the hygienist to present her work in school and to the public generally. They are: education (principles of teaching), child psychology, public speaking, applied oral hygiene, sociology and nutrition. Other related subjects may be elected from those offered by the college. The full course will cover two summer sessions. College credits are given. The staff of instructors, principally from the state education and state health departments, University of Buffalo and State Teachers College, have been chosen for their practical field experience.

Tuition is free to residents of New York State. Twenty-five dollars will be charged nonresidents. Living expenses approximate $15 a week. Classes are held five days a week from July 2 to August 10.

For registration and a detailed announcement of the course, address S. R. Meaker, State Education Department, Albany, N. Y.

This course has been approved by the state education department as meeting the requirement for certification as a dental hygiene teacher.

NOTICE

The bill requiring annual registration of all dentists in active practice in the Commonwealth of Massachusetts was passed during the last session of the Legislature and becomes a law before April 1, 1928. This law has been advocated by the Board of Dental Examiners and the Massachusetts Dental Society for a number of years and its final passage will be of great value as a measure of protection from the unlawful practitioner for both the public and the legal practitioner. The measure calls for annual registration, with a fee of $2.00, before April 1, 1928, of all dentists in active practice in the Commonwealth of Massachusetts together with such information as may be necessary to carry out the provisions of the act.

W. HENRY GRANT, *Secretary*,
Board of Dental Examiners.

AMERICAN DENTAL HYGIENISTS ASSOCIATION

The next annual meeting of the American Dental Hygienists' Association will be held in Minneapolis, August 20-23. Headquarters will be at the Curtis Hotel, which is conveniently located. All ethical dental hygienists are cordially invited to attend.

AGNES G. MORRIS, *Secretary*,
886 Main St.,
Bridgeport, Conn.